WAR DEPARTMENT

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TECHNICAL MANUAL

MEDICAL DEPARTMENT SOLDIER'S HANDBOOK

March 5, 1941

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No. 8-220

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WASHINGTON, *March 5, 1941.*

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MEDICAL DEPARTMENT SOLDIER'S HANDBOOK

Prepared under direction of
The Surgeon General

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FOREWORD

The Medical Department of the United States Army has manifested considerable foreknowledge in its realization that its efficiency has and will always depend to a considerable degree upon the instruction and training of its enlisted personnel.

In 1862, Surgeon General Hammond, realizing a long-felt deficiency in the training of the hospital stewards, wardmasters, and attendants, commissioned Assistant Surgeon J. J. Woodward to prepare a manual to be known as *The Hospital Stewards' Manual*, which was subsequently adopted for the training of this personnel, and as an authority in all military hospitals in the United States.

Soon after Congress authorized the organization of the Hospital Corps for the Army in 1888, Assistant Surgeon General Smart wrote and published a handbook for the Corps which was successfully used for a number of years. The adoption of a regular scheme of instruction for the Hospital Corps necessitated a handbook which would include in a concise form and in one volume all the various subjects to be taught. To supply this need Major Surgeon Mason edited and published, in 1906, a comprehensive handbook for the Hospital Corps of all the armed forces of the United States.

Specialization necessitated a new handbook in order to present up-to-date instructions, and in 1927 Colonel Tuttle edited and published his handbook for the Medical Department soldier.

Since the formation of the Medical Corps more than 50 years ago under the authorship of Smart, Mason, and Tuttle, a handbook has been in use without interruption throughout the entire period, and has served a most valuable training role. It has provided an inherited culture and an enduring inspiration to the medical soldier. With the decision of the War Department to take over the publication of this work, its title and much of its material were borrowed. This material represents the understanding, experience, and knowledge of the several authors and as a sound training medium has stood the test of time.

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CHANGES } No. 1 }

WAR DEPARTMENT,
WASHINGTON, July 13, 1942.

TM 8-220, March 5, 1941, is changed as follows:

CHAPTER 3

MINOR SURGERY AND MEDICAL AID

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SECTION VIII (ADDED)

VETERINARY OPERATING ROOM AND SURGICAL TECHNIQUE

185.01. General.—The term "surgical technique" as used in this section implies the preparation of the patient, instruments, other material, and room or other place for the purpose of the surgical treatment of military animals (the horse and mule). Such preparation is a highly important part of the veterinary surgical technician's duties.

185.02. Operating room.—*a.* The operating room of a veterinary hospital for large animals must be of sufficient size and height to permit handling such animals with a minimum of danger to the patient and attendants. The walls should be built of impervious material with a smooth surface to permit thorough cleansing. Since the veterinary patient walks rather than rides into the operating room, the floor should be of cement with a roughened surface to avoid injury by the patient falling. An abundance of natural and artificial light is essential, and windows and lighting fixtures should be protected from breakage by the patient.

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b. The operating room must contain various forms of restrain These usually include—

(1) A *strong horizontal pipe* attached to uprights about 4 feet hig securely imbedded in the floor, and extending along and about 4 fee from the wall containing the windows. This "hitch rack" protect the windows, provides a secure place to tie the patient, and permits th operator to get in front of the animal for preliminary examinatio or similar purposes.

(2) A *set of stocks*, also built of strong pipe, permanently imbedde in the floor and containing a movable wooden standing to give th patient a secure footing. Stocks are used to restrain animals for oper ations in the standing position where such restraint appears necessar due to the temperament of the patient or the nature of the operation

c. Operating tables for large animals are of various patented type but all consist of a heavy table top secured to a strong base in such way that the top can be mechanically turned to either an upright o a horizontal position. In the upright position the table appears some what as a large wall panel. The horse is led abreast of the table i this position, strapped securely to it by means of two strong bell bands, and the top mechanically turned to the horizontal position carrying the patient with it and placing him on his side. His leg and head are then secured to the table and he can thus be held in thi position practically without movement. This form of restraint i used for major operations under general anaesthesia or in cases wher absolute immobility is necessary. The patient is usually given a hyp notic prior to placing on the table in order to allay his excitement from fear.

d. Other operating room equipment includes small tables and stands for surgical dressings and instruments; irrigating apparatus basins, pans, etc., the number and contents of which are dependent on the particular operation at hand.

185.03. Adjoining rooms.—The number and purpose of adjoin ing rooms will depend on the size of the hospital. At least two are necessary. These include a utility room and a recovery stall.

a. The utility room will contain instrument cabinets, lockers and shelf space, and similar equipment necessary for the proper care and storage of instruments, dressings, and other operating room supplies.

b. The recovery stall is located directly adjacent to the operating table and provided with a wide door so arranged that it can be raised and a recumbent patient slid from the table into the stall for recovery following general anaesthesia. The stall must be large and roomy

(about 16 feet square), preferably with the corners blocked off with a "knee-board" to prevent injury to a patient struggling to regain its feet. A knee-board is built of 2-inch planking about 4 feet high with the lower ends set 1 foot from the wall and the upper ends touching the wall. The diameter of the room at the floor is thus decreased by 2 feet, resulting in somewhat of a bowl. The floor, usually of cement, must be covered with an abundance of bedding.

185.04. Cleanliness.—The operating room and adjoining rooms must be kept scrupulously clean. They should be routinely cleaned immediately following an operation and once a week scrubbed thoroughly with soap and water, paying particular attention to ceilings, corners, windows, fixtures, and such places where dust and dirt may accumulate. The utility room should be kept neatly arranged with all equipment in its proper place and readily available for immediate use.

185.05. Instruments.—Instruments are carefully cleaned immediately following an operation, boiled, dried, wiped with light oil, and placed in the instrument cabinet. Cutting instruments should be sharpened if necessary and so handled as to avoid dulling. Hypodermic needles and syringes are cared for as follows: Wash thoroughly with tap water, boil, wash with alcohol, and then wash with ether to remove the residual moisture. The plunger is removed from the large (10- to 30-cc) syringe and the barrel and plunger wrapped separately in gauze and then wrapped together with paper. The needle is placed in a small test tube, with its point protected by a pledget of cotton, and the tube is plugged. The small 1-cc syringe is left intact with the plunger in and the needle attached. This complete syringe and needle is then placed in a large test tube into which has been placed a pledget of cotton to protect the needle point, and the tube is plugged. The several syringes and needles as thus prepared are then sterilized in dry heat (160° C.) and stored in a covered box or case where they are available for immediate use.

185.06. Sterilization.—See paragraph 118*j* and *k*.

185.07. Operating personnel.—An operating team consists of the veterinary surgeon, an assistant, four technicians to handle the patient, and may or may not include an anaesthetist.

a. The veterinary surgeon is responsible for the success or failure of the operation.

b. The assistant has charge of the instruments and dressings and assists the operator as directed. He usually completes the preparation of the site of the operation.

c. The technicians may make the preliminary preparation of the patient and are then concerned with his restraint. In some cases, with intractable animals, additional help may be needed, particularly if the patient is to be cast or placed on the table. In no case should the operator or his assistant be required to assist in the control of the animal. Technicians must be active individuals in good physical condition, and with an inherent interest in large animals. They should have a keen sense of observation and be familiar with the normal habits and reactions of horses and mules. They must be trained and adept in the use of various forms of restraint. Other essential characteristics include an even temper, dependability, neatness, and an appreciation of the importance of system and detail.

d. Most veterinary operations are performed under local anaesthesia, with or without the use of a hypnotic such as chloral hydrate or cannabis. In such cases the operating surgeon will be his own anaesthetist. If chloroform is to be used, an anaesthetist other than the operator will be necessary.

185.08. Preparation for the operation.—In most Army veterinary hospitals the operating personnel have other duties in connection with the treatment of disabled animals, and the place of operation may also have to serve a dual purpose. In such situations the time for operating is deferred until the other work is completed, the room thoroughly cleaned, and the operation can proceed without interruption. This time will usually be in the early afternoon. Under the direction of the operator, the assistant will make the necessary preparations. The selection of the instruments will depend on the nature of the operation but will ordinarily include scalpels, scissors, various types of forceps, directors, retractors, needle holders, needles and sutures, together with any special instruments desired by the operator for the case at hand. These are sterilized by boiling. Hypodermic syringe and needle packages (previously sterilized) and the necessary dressings are selected, and the anaesthetic made ready for use. Basins, pans, irrigators, antiseptic solutions, etc., are prepared. The room is checked to see that the restraining equipment is in order and complete.

185.09. Restraint.—Some form of restraint is necessary in every veterinary operation. It may be very simple and have for its object the mere attraction of the patient's attention from the operator, or it may be in such form as to prevent any movement of any part of the body. Forms of restraint include holding, with a slight twist, one or both of the animal's ears; the nose twitch; the side line; stocks; operating table; the various types of casting harness. In training technicians in the use of restraint it is desirable to begin with a quiet animal,

ad this training should continue until all forms are thoroughly nderstood and can be expertly applied. The animal must be handled uietly but firmly; and the team must work as a unit without the loss f temper. Any semblance of a "fight" between the technician and he patient must be avoided. The simplest form of restraint which vill suffice for the case at hand is usually the best form. In deciding vhich form to use the temperament of the patient must obviously be onsidered. There is a greater or less element of danger in all forms f restraint and unfortunate accidents can be kept at a minimum only y well-trained technicians. The success of an operation is largely lependent on good restraint, expertly applied by efficient personnel. Their selection and training is therefore of the greatest importance.

185.10. **Preparation of the patient.**—A given operation having been decided on, the stable sergeant (wardmaster) is advised of the desired diet and the preliminary preparation of the patient is made by the operating room technicians. This may include removing the shoes, trimming the feet, clipping all or certain parts of the hair, a thorough grooming of the entire body, and shaving the field of operation. In cases involving the feet or lower legs, the site of operation is often cleaned and shaved 24 hours prior to operating and covered with a wet (1 to 1,000) bichloride of mercury pack. After the patient has been restrained, preparation of the field of operation continues as follows: Cleanse thoroughly with a soapy disinfectant solution; wipe with dry cotton; cleanse with alcohol, again wipe with dry cotton; apply tincture iodine, and after allowing to dry, proceed with the operation. It must be remembered that even in well-groomed horses the skin is not clean and that it can be rendered so only by *shaving* and cleansing according to the preceding or a similar plan.

185.11. **Removal of restraint.**—The operation is not complete until the patient has been released from restraint and returned to the ward or recovery stall. In general anaesthesia, this is accomplished by elevating the operating table top and sliding the recumbent patient directly into the recovery stall. If the patient is under the influence of a hypnotic, special care must be observed to prevent his falling when released from restraint; this is particularly true when removing such a case from the operating table.

185.12. **After care.**—Special care following an operation may include some form of modified restraint such as the cross-tie, slings, etc., the application and adjustment of which is a part of the technician's duties. He must therefore be trained in the proper use of such apparatus.

[A. G. 062.11 (2-3-42).] (C 1, July 13, 1942.)

252. Field water supplies.

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e. Purification.

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(3) *Chlorination.*—* * *

(*a*) *Water sterilizing bag method.*—The procedure is as follows:

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7. When especially trained * * * the following manner: Wait 10 minutes, then wash out one of the faucets by allowing a small amount of water to run through onto the ground. Fill a clean canteen cup **to a depth of ½ inch with** water from the same faucet. Add 1 cc (15 drops) of orthotolidine testing solution to the water in the cup. Wait 5 minutes and note the color produced. Below is a guide for reading the color reaction between the free chlorine and orthotolidine:

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[A. G. 062.11 (4-27-42).] (C 1, July 13, 1942.)

CHAPTER 8

VETERINARY FOOD INSPECTION

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SECTION IV (ADDED)

DEFINITIONS OF TERMS USED IN CONNECTION WITH MEAT AND DAIRY PRODUCTS

402. Definitions of terms used in connection with meat and dairy products.

Aged beef.—Beef that has been stored under ordinary refrigeration (36° to 38° F.) from 2 to 8 weeks and is more tender than fresh beef due to the action of digestive enzymes which change the chemistry of the connective tissue from collagen and elastin into gelatin. Beef is also aged by a "tendray process" through the use of "sterilamps" which materially reduce the time required for the chemical changes mentioned.

Air cell (*egg*).—When the egg is newly laid and warm, the two membranes, which are fibrous and composed of chitin, are in contact with each other at all points because the volume of the shell is completely filled. On cooling from its initial temperature there is a slight reduction in volume of the egg contents, and a small air space may be noted in the larger end of the egg because the egg membrane recedes from the shell. Thus an air space is left between the two membranes, which may increase in size if the volume of the egg contents decreases any further. Evaporation or loss of water would also tend to cause such a decrease in volume and result in a larger air space. For this reason the size of the air cell of an egg may be used as an index of quality, and, to some extent, of age.

Aitchbone.—Portion of the pubic arch exposed as a result of splitting the pelvis through the symphysis pubis. The bone on the inner side of a hind quarter of beef; slightly S-shaped in steers and heifers. It is directly posterior to the aitch bone that the pizzle eye's presence is noted in carcasses from males.

American (*or cheddar*) *cheese.*—A hard cheese without gas holes which has varying degrees of color. Made by the addition of lactic acid starter and rennet to milk, with or without coloring. After the curd is ditched, the cheddaring process, or the piling and matting of the curd, is done. This is where this cheese derives the name

cheddar. A large percentage of cheese manufactured in United States is of this variety.

A. M. S.—The Agricultural Marketing Service of the United States Department of Agriculture.

Ante mortem (*inspection*).—Examination of live animals within 24 hours of time of slaughter for indications of disease or conditions that would render them unfit for human consumption.

Babcock test.—A chemical test developed by Professor Babcock of the University of Wisconsin. Used to determine the percentage of butterfat in a given sample of milk or cream.

Back (*lamb*).—A wholesale cut that consists of the loin and rack. Lamb back contains all of the desirable chops from a lamb carcass.

Back packing (*hams*).—The storing under low refrigeration of cured or partially cured, unsmoked meats for which there is no immediate market.

Bacterial count (*milk*).—The term bacterial count refers to the number of bacteria in 1 cc of a dairy product.

B. A. E.—The Bureau of Agricultural Economics of the United States Department of Agriculture.

B. A. I.—The Bureau of Animal Industry of the United States Department of Agriculture.

Bald spot (*beef*).—The exposed muscle located adjacent to the point of the aitch bone. Usually round or oval in shape and somewhat larger than a silver dollar. Only found in male carcasses.

Barrow.—A male swine that has been castrated before reaching sexual maturity. Corresponds to a steer.

Beef.—Meat derived from cattle 1 year of age or older.

Beef bladders (*urinary bladder*).—Used as casings for mortadella, minced sausage, and luncheon specialities.

Beef bungs.—The caecum and first 4 feet of the folded colon.

Beef middles.—That part of the large intestines remaining after the first 4 feet of the folded colon have been removed for beef bungs.

Beef trimmings (*commercial*).—Include large boneless pieces of lean meat too deficient in conformation, finish, and quality to be used for market cuts, and smaller, irregular pieces from cutting and boning rooms.

Beef rounds.—The small intestine up to but not including the ileo-caecal valve.

Black rot (*egg*).—A decomposed egg the contents of which are gray or black in color when seen before the candle.

Blind checks (*egg*).—An egg whose shell is very slightly cracked. The shell membrane is not broken. These often occur within the oviduct of the chicken and are usually sealed from within.

Blood ring (*egg*).—An egg in which germ development has taken place to the point that the blood veins have formed around it, giving a reddish glow and visible presence of blood veins before the candle.

Blood sausage (*blood puddings*).—Prepared from blood mixed with small cubes of cooked fats, lean pork meat, heart, tongue, hog skin, spices, etc. These ingredients are cooked, comminuted, mixed with blood and spices, stuffed into large casings, and recooked.

Bloody white (*egg*).—One which has a general reddish appearance due to blood mixed through it and which may show spots of blood floating in the white.

Blue (*cheese*).—A semihard cheese made from cows' milk and ripened by mold. Very similar in appearance to Roquefort cheese which is made from sheeps' milk. One of the most striking characteristics of this cheese is the mottled or marbled appearance of the interior, due to the development of a blue green mold known as penicillium Roqueforti which is introduced into the curd by sprinkling it with moldy barley bread.

Boar.—Mature male swine that has not been castrated and is used for breeding purposes. Corresponds to bull.

Bob veal (*immature veal*).—A calf, usually of the dairy type, and between 1 and 10 days of age. Carcasses are lacking in physical development, and the muscles are gray, soft, and watery. Not considered edible.

Boneless beef (*U. S. Army*).—Beef that has been selected and purchased on a class 3 inspection, then boned at the packing plant under Veterinary Corps supervision, and packed in specified containers as roasts and steaks 50 percent; stewing and boiling beef 25 percent; ground beef 25 percent.

Boston butt.—Derived from the thick end of the shoulder and has the blade bone in. It is the remaining part of a shoulder from which a picnic has been removed. Usually sold fresh.

Bouillion cubes.—Consist of various mixtures of meat extract, peptones, gelatin, and condiments. Usually about the size of large dice, tin foil wrapped, and packed in metal boxes.

Brawn.—A product made from chopped or ground and cooked edible parts of swine, chiefly from the head, feet, and/or legs, with or without chopped or ground tongue. (*See* Head cheese.)

Break joint (*lamb*).—The result of the removal of the forefeet by a fracture through the epiphyseal cartilage of the distal end of the large metacarpal bone; leaving a broad, moist, dentated, pink surface which is called the "break joint" of lamb.

Brisket off (*bacon*).—Bacon from which the brisket end or the shoulder end has been removed just behind the "curl."

Broilers (*chicken*).—Young chickens approximately 8 to 12 weeks old, of either sex, weighing from 1½ to 2½ pounds.

Bull.—Mature male bovine animal that has not been castrated and is used for breeding purposes.

Butter.—A food product which is made exclusively from milk or cream, or both; with or without common salt, with or without additional coloring matter, and containing not less than 80 percent by weight of milk fat, all tolerances having been allowed for.

Buttermilk.—The product that remains when fat is removed from milk or cream, sweet or sour, in the process of churning.

Buttons (*beef carcasses*).—The pearly-white to reddish-white cartillages that are found on the superior processes of the thoracic vertebrae of beef carcasses from young animals.

Calf (*carcass or cut*).—Meat derived from a young bovine of either sex whose milk diet has been supplemented by grain and roughage. Usually from 3 to 9 months old.

Calla (*pork*).—Same as picnic.

Canned meat.—Fresh meat, prepared meat, or cured meat, packed in hermetically sealed containers with or without subsequent heating for the purpose of sterilization.

Canning tongue (*beef*).—Tongues which are trimmed close without any laryngeal cartilages remaining attached and weigh from 2 to 3½ pounds.

Cap leaks.—Leaks in the solder holding the cap are known as cap leaks. These are often due to small particles of meat projecting from the interior of the can which was not properly wiped before the cap was put on.

Capons (*chicken*).—Unsexed male birds weighing over 4 pounds, usually marketed between 7 and 10 months of age.

Carcass.—The commercially prepared or dressed body of cattle, sheep, swine, or goat intended for human food.

Casings.—Sack-like containers used for sausages and meat loaf. *Sheep casings.*—The small intestine of sheep, up to but not including the ileocaecal valve. *Hog casings.*—The small intestine of swine, up to but not including the ileocaecal valve. *Artificial casings.*—Made of cellulose in various sizes. They are not an animal product.

Caul fat.—The omentum (fat) surrounding the stomach, or the mesentery of the intestines. In some localities it is wrapped around the legs of lamb and rounds of veal at the time of dressing while still warm. Federal specifications for lamb and veal require its removal.

Certified milk.—Milk produced under the supervision of the American Association of Medical Milk Commissioners. This is the highest grade of milk which may be obtained in any American market.

Checks (egg).—An egg shell which is slightly cracked. The shell membrane is not broken.

Cheddars (cheese).—A style of packaging American (or cheddar) cheese. A large cylinder of cheese about 20 inches in diameter and 20 inches in height, weighing 70 to 75 pounds.

Cheese.—The product made from curd obtained from the whole, partly skimmed, or skimmed milk of cows or other animals, with or without added cream. Made by coagulating the casein with rennet, lactic acid, or other suitable coagulent, and with or without further treatment of the separated curd by heat or pressure, or by means of ripening ferments, special molds, or seasoning.

Chine bone.—The split surface of the vertebrae of an animal carcass. Particularly the superior processes of the thoracic vertebrae of beef upon which are found cartilage referred to as "buttons."

Chitterling.—The large intestines from hogs, properly cleaned and sold fresh or frozen as an edible product. Used mostly in the South.

Clipped lambs.—Lambs, usually 8 to 10 months old, from which the fleece has been shorn before they are sent to slaughter.

Closed side (beef).—The right side of a beef carcass to which the kidney knob is adherent.

Cocks (chicken).—Mature male birds of any weight with darkened and toughened flesh.

Cod fat (beef).—The fat which accumulates in the region of the scrotum of a castrated male bovine animal.

Cold slaughter.—The carcass of an animal that has died from some cause other than slaughter and whose carcass has been manipulated to try to represent that of a slaughtered carcass.

Collapsed cans.—Cans which have collapsed or buckled in the vacuum machine because they were not properly filled.

Conformation.—One of the three grading factors of animal carcasses and wholesale cuts of meat. Includes the general build, form, shape, or outline of the carcass, side, or cut.

Cooking oil.—Deodorized and neutralized vegetable oils used for edible purposes.

Corned beef.—Beef which has been cured in a solution of common salt with or without nitrates, nitrites, and sugar.

Cow.—A mature female bovine that has given birth to one or more calves.

Crack (egg).—A cracked egg with the shell membrane broken but the egg membrane intact. The egg does not leak.

NOTE.—The A. M. S. classes "U. S. checks" or "U. S. crack" together.

Cream.—That portion of milk which contains not less than 18 percent milk fat.

Creamery butter.—Butter that is made at a creamery or butter factory.

Crusted yolk (egg).—A yolk which is covered with light colored crust which has a tendency to flake off. The white is watery and yellowish in color and possesses a putrid odor.

Cultured buttermilk.—The product obtained by souring pasteurized skimmed or partially skimmed milk by means of a suitable culture of bacteria.

Cured meat.—The product obtained by subjecting meat to a process of salting by the employment of dry salt, or brine, with or without the use of nitrates, nitrites, sugar, and spices.

Dairy butter (homemade butter).—Butter that is made on the farm.

Dairy farm.—An "establishment" where milk is produced for use as food in the form of fluid milk, or any other form of dairy products.

Daisey (cheese).—A style of packaging American (cheddar) cheese. A large cylinder of cheese about 20 inches in diameter and 5 inches in height, weighing 20 to 26 pounds.

Deckel (corned beef).—This term applies to the brisket only and is that portion exposed after the ribs have been removed from the inner face. Consists of the fat, fascia, and rib fingers that lie between the ribs and the muscle of the brisket. The deckel must be removed to meet Federal specifications.

Do-overcans.—Defective cans which are discovered after processing and before going to the washing machine. These cans are repaired and reprocessed or "done over."

Dried eggs.—Eggs in their natural proportions as broken from the shell except that they shall contain a maximum of 7 percent moisture. They are in powder form but must be readily reconstituted into a smooth, homogenous mixture by the addition of water.

Dried meat.—The product obtained by subjecting fresh or cured meat to a process of drying, with or without the aid of artificial heat, until a substantial portion of the water has been removed.

Dry salt meat.—Meat which has been cured by the application of dry salt with or without the injection of brine.

Dried skim milk or dry milk solids not over 1½ percent fat.—Fresh, sweet, liquid milk from which nearly all the fat and water have been removed, leaving a fine creamy white powder. Approximate composition: 51 percent milk sugar (lactose), 8 percent milk minerals (Ca. & P.), 37 percent milk proteins (casein), 3 percent water, 1 percent fat.

Duckling.—A young duck, of either sex, usually weighing 4 to 6 pounds, with an easily collapsible trachea.

Establishment.—Any place where animals, or products of animal origin such as beef, pork, veal, mutton, lamb, poultry, game, and other meats; fish, oysters, and other seafoods; eggs, milk, butter, cheese, ice cream, and similar products, whether fresh, frozen, or otherwise processed or prepared are intended for human consumption.

Evaporated separated (skim) milk.—The product resulting from the evaporation of a portion of the water from fresh liquid separated milk. Average composition: Milk fat—trace; milk solids—20 percent; water—80 percent.

Evaporated whole milk.—Evaporated (unsweetened condensed) milk is the product resulting from the evaporation of a portion of the water from fresh, whole liquid milk. Average composition: 8 percent milk fat; 18 percent fat free solids; 74 percent water.

Ewe (lamb).—A young female sheep that has not given birth to lambs. Corresponds to heifer.

Ewe (sheep).—An adult female sheep that has given birth to lambs. Corresponds to a cow.

Feather bones (bacon).—The thin flat pieces of rib bone (intercostal cartilage) sometimes found on cured or on fresh pork bellies.

Feathering (beef).—The intermingling of fat with the lean in the intercostal muscles, or the muscles between the ribs.

Feeder cattle.—Cattle that have the size and quality but not the fat required for profitable slaughter.

Fell (lamb).—The fascia covering the exterior of a lamb carcass.

Filet (fish).—A longitudinal cut from the long axis of a fish. It is usually boneless.

Filler (egg case).—Heavy cardboard square-shaped containers, open on both ends. They are divided into thirty-six compartments of equal size, each to hold one egg, with a view to preventing breakage.

Finish.—One of the three grading factors of animal carcasses and wholesale cuts of meat. Includes the amount, color, character, and distribution of exterior and interior fat.

Flat cans.—A can in which the ends are flat or curved slightly inward.

Flats (*cheese*).—A style of packaging American (or cheddar) cheese. A large cylinder of cheese about 20 inches in diameter and 7 inches in height. Weighs 32 to 34 pounds.

Flats (*egg case*).—Heavy, flat pieces of cardboard, approximately 12 inches square, used to separate the fillers of an egg case. One style is indented with 36 impressions which makes them more resilient and tends to hold the eggs in an upright position.

Flesh.—Any edible part of the striated muscle of an animal used as a source of food.

Flippers (*cans*).—The can is normally flat. The "flipper" condition is indicated on percussion by the bulging of one end of the can. When the end is forced back the can remains flat.

Forefeet (*swine*) "*pigs feet*".—The forefeet are much more desirable than the hind feet and are usually sold fresh. They may be cooked, pickled, or jellied, and contain a large percentage of gelatin. Usually removed from the carcass 1 inch above the knee.

Fore saddle (*lamb or veal*).—All of the unsplit front half of a carcass of lamb or veal anterior to the twelfth rib. Contains twelve pairs of ribs, rack, and triangle.

Fowls (*chickens*).—Fowls are mature chickens with toughened flesh and hardened breast bone.

Fresh chilled.—This term refers to the refrigeration of freshly killed animal carcasses in a cooler at a temperature close to but above freezing. Coolers for fresh killed meat are usually held at between 36° and 40° F.

Fresh egg.—One that has been handled in such a manner that it retains many of the characteristics of a newly laid egg. The degree of freshness depends on the age of the egg and the manner in which it is handled up to the time it is offered for sale.

Fresh frozen.—This term refers to the refrigeration of fresh chilled animal carcasses to a temperature of −10° F. where every particle of the product stored is completely frozen. The time limit for fresh frozen products is usually 6 months after date of freezing.

Fresh killed (*poultry*).—Poultry which is thoroughly chilled immediately after dressing, and delivered within 48 hours.

Fresh meat.—Meat which has undergone no substantial change in character since the time of slaughter.

Frozen eggs.—Eggs in their natural proportions as broken from the shell and frozen solid.

Fryers (*chicken*).—Young chickens approximately 10 to 14 weeks old, of either sex, weighing from 2½ to 3½ pounds.

Gambrel.—A bent stick, stainless steel or galvanized iron, that has been fabricated for use by butchers for suspending carcasses of animals from the rail.

Germ spot (*egg*).—A circumscribed light-yellow colored germ located on the egg yolk. In an infertile egg this germ is slightly visible after the egg is broken; contains only the ovum or female reproductive cell; is small and irregular in shape; and does not grow or develop. In a fertile egg it is readily visible after the egg is broken; contains both the female and male reproductive cells; is round, and will grow or develop under proper temperature conditions. The size depends upon the extent of its development.

Gilt.—A young female swine that has not given birth to young. Corresponds to a heifer.

Goat's milk.—The fresh lacteal secretion, free from colostrum, obtained by the milking of a healthy goat.

Grass egg.—An egg with an olive-colored yolk which presents a greenish cast to the whole egg under the candle.

Greased butter.—Any butter that is unwholesome or otherwise unfit for ladling or renovating. Greased butter is inedible.

Hanging tenderloin (*beef*).—The pillars of the diaphragm. An irregular piece of lean beef found in the "open" or left side of a carcass of beef, weighing from 3 to 4 pounds. Usually used for ground beef.

Hard chilled poultry.—Poultry which is frozen solid but is utilized or consumed before it suffers freezer deterioration. Unless used within 30 days after slaughter it becomes frozen or storage poultry.

Head cheese.—Differs from brawn in that other meat and/or meat byproducts are substituted, in all or in part, for corresponding parts derived from swine. (*See* Brawn.)

Heart cap.—The contiguous blood vessels, auricles, and connective tissue found at the top of an untrimmed heart.

Heifer.—A female bovine animal that has not given birth to a calf.

Hind saddle.—All of the unsplit hind half of a carcass of lamb or veal posterior to the twelfth rib. Consists of loin, legs, and flank.

Hocks (*pork*).—That portion of the forelegs from knee to elbow joint; and that portion of hind leg between the tarsus and patella that is removed by some packers in making an extra short cut ham. Variable lengths.

Hog bungs.—The rectum, including the anal ring, and a part of the colon from swine, prepared for use as a natural casing. They are 3 to 6 feet long.

Homogenized milk (*or cream*).—Milk (or cream) that has been mechanically treated in such a manner as to alter its physical proper-

ties, with particular reference to the condition, size, and appearance of the fat globules. This is accomplished by forcing the milk (or cream) through a fine valve at a pressure of 2,500 to 3,000 pounds per square inch.

Hot house lamb.—A young ovine produced under cover and marketed from January to March, usually weighing from 20 to 35 pounds.

I. A. M. P.—The Institute of American Meat Packers, 59 East Van Buren Street, Chicago, Illinois. An association of meat packers. Also known as A. M. I. (American Meat Institute).

Ice cream plant.—An "establishment" where milk and milk products are received, stored, mixed, pasteurized, homogenized, cooled, aged, frozen, packaged, and hardened for human consumption as ice cream.

Jowls (pork).—The fatty portion between the shoulder and jaw trimmed up and called jowl butts, jowl squares, dixie squares, and other trade names. Usually cured.

Kid.—A young goat, corresponding to a lamb in the sheep family.

Kidney knob.—The kidney and its surrounding fat. Ordinarily refers to beef kidney.

Ladled butter.—Made by reworking miscellaneous lots of dairy and other butter.

Lamb.—A young sheep, usually 14 months or younger.

Lard.—The rendered fresh fat from hogs.

Lard substitute.—A lard-like compound composed of animal and vegetable fats or vegetable fats only.

Leaf lard.—Lard rendered from the internal fat of the abdomen of the hog, excluding that adherent to the intestines.

Lebanon bologna.—Bologna made by a special process at Lebanon, Pennsylvania, *only*. Similar product made elsewhere is known as Lebanon style bologna. It is finely chopped, spiced without garlic, heavily smoked, and packed in beef lungs and large artificial casings.

Lights.—Synonomous with lungs.

Linking.—The twisting or tying of natural or artificial stuffed casings at regular intervals to divide the contents into small units or "links" of sausage.

Loin shell (beef).—The short loin of beef with the tenderloin removed. This cut of meat is often mistaken for a rib of beef.

Long cut ham.—Cut from the hind leg of a hog carcass by removing the foot between the tarsus and large metatarsal bone; and separated from the side, usually at the slip joint (sacro-iliac articulation), leaving the entire ilium on the ham. Some long cut hams are separated from the side in the same manner as a regular short cut ham

the only difference between the two then being in the manner of separating the foot.

Long cut tongue (*beef*).—The tongue as it is removed after the head inspection on the killing floor. The hyoid bones are fractured and the tongue is disengaged from the jaw bone. It contains ordinarily three or four tracheal rings and the adjacent lymph glands, fascia, and fat.

Longhorn (*cheese*).—A style of packaging American or (cheddar) cheese. A small cylinder of cheese about 8 inches in diameter and 12 inches in height weighing 12 to 14 pounds.

Malted milk.—The product made by combining whole milk with the liquid separated from a mash of ground barley and wheat flour, with or without sodium chloride, in such a manner as to secure the full enzymic action of the malt extract, after which the water is removed.

Measles, beef (*cysticercus bovis*).—Beef muscle infested with oval, grayish-white larvae (cysticercus bovis) of a specie of tapeworm commonly found in man.

Meat.—The properly dressed flesh derived from cattle, swine, sheep, and goats sufficiently mature, and in such health at the time of slaughter that it is fit for human consumption. The term "meat" when used in qualified form as for example "horse meat," "crab meat," etc., is then properly applied to corresponding portions of animals other than cattle, swine, sheep, and goats.

Meat byproducts.—Edible parts, such as hearts, livers, kidneys, tongues, tails, sweetbreads, brains, lungs, melts, stomachs, lips, snouts, and ears, derived from cattle, sheep, swine, and goats.

Meat loaf.—The product consisting of a mixture of comminuted meat with spice and/or with cereals with or without milk and/or eggs, pressed into the form of a loaf and cooked.

Meat skipper (*piophila casei*).—The larva of a small black fly which is found in all parts of the United States and is attracted to smoked meat. The fly deposits its eggs on the surface, or in the crevices of smoked meat, and the larva hatch in about 36 hours. They are slender and white and move by jumping or "skipping." When about to "skip" the two extremities are drawn together and then suddenly extended, the larva in this way jumping from 3 to 12 inches. After about 2 weeks the larva crawls to some safe hiding place and passes through the pupa stage emerging as an adult fly about 1 week later. Common to smoked ham, dried beef, smoked cheese. Unless properly protected such foods may be seriously damaged by this insect pest.

Meat spot (egg).—Small pieces of tissue usually in the egg white. They can be seen by candling.

Melt (spleen).—In cattle, weighs about 2 pounds and is attached to the rumen. In lambs it is quite small and usually left in the carcass.

Milk.—The whole, fresh, lacteal secretion obtained by the complete milking of one or more healthy cows, excluding that obtained within 15 days before and 5 days after calving, or such longer period as may be necessary to render the milk colostrum free. The term "milk" unqualified means cows' milk.

Milk fat.—The main constituent of cream, and it is from this that butter is made. It is much lighter than milk, and unless homogenized will rise to the top of the container.

Milk plant.—An "establishment" where milk is received, pasteurized, cooled, and bottled for human consumption as fluid milk, chocolate milk, chocolate milk drink, buttermilk, coffee cream, or whipping cream.

Mixed rot (egg).—An egg in which the yolk is broken and partially mixed with the white.

Modified milk.—The cream of cows' milk mixed with water and lactose in proper proportions and used for infant feeding.

Moldy egg.—One which has developed moldy spots within the egg shell. Advanced stages may cause the entire egg to appear black before the candle.

Mutton.—Meat derived from mature sheep of either sex.

Neck bones (pork).—The cervical and first three or four thoracic vertebrae of pork.

New York style shoulder.—The entire shoulder, the foot cut off 1 inch above the knee, butted 1 inch from the blade bone, trimmed smooth, neck bones, neck, and breast flap removed and trimmed close. May be either skinned or left with the skin on.

Offal.—Consists of various products other than the carcass, derived from an animal at the time of slaughter. Includes the tongue, liver, spleen, edible viscera, glands sold for pharmaceutical purposes, and similar parts of the animal.

Oleo stock.—The clarified liquid oil obtained by melting beef fats and allowing the scrap and water to settle out.

Open side (beef).—The left side of a beef carcass. Contains the hanging tenderloin. The side in which the kidney knob is somewhat loose.

Overflow (beef).—The internal fat covering the inside of the ribs of a front quarter of beef.

Overhauling.—The piece by piece movement and restacking of meats in the process of curing. Made for the purpose of insuring contact of the curing agent to all surfaces of the meat, and usually accompanied by an additional application of the particular curing agent being used.

Overstuffed cans.—Cans which have had too much meat forced into them by the stuffing machine, causing the cans to bulge.

Packers' cans.—Known as "hole and cap" cans with soldered seams and with a hole in the top varying in size and shape according to the product packed.

Pasteurized milk.—Milk of which every particle has been subjected to heating to a temperature of not lower than 142° F. for not less than 30 minutes (or 160° F. for 15 seconds) and then promptly cooled to 50° F. or lower.

Picnic.—The lower end of a pork shoulder cut two and one-half ribs wide and with the foot removed about 1 inch above the knee joint. It is trimmed full on the face and has the butt removed at the point above the shoulder joint where the blade bone begins to widen.

Pig.—A young swine which has not reached sexual maturity.

Pizzle eye (beef).—The remains of the crural attachments of the penis. It is located at the pointed end of the aitch bone.

Pluck.—The thoracic viscera. Usually consists of trachea, lungs, heart, and adjacent lymph glands.

Pork.—Meat derived from swine of either sex and of any age.

Pork trimmings.—In cutting and trimming pork many scraps of muscle tissue result. This lean pork is considered pork trimmings and is utilized in the manufacture of sausages.

Post mortem (inspection).—A careful, sanitary inspection performed on all meat food animals immediately after slaughter to eliminate carcasses from diseased or injured animals. Consists of head, viscera, and rail inspection.

Potted meat (deviled meat).—The product obtained by comminuting and cooking fresh meat and/or prepared meat, usually spiced and packed in hermetically sealed containers.

Prepared meat.—The products obtained by subjecting meat to a process of comminuting, drying, curing, smoking, cooking, seasoning, or flavoring, or any combination of such processes.

Print loaf (cheese).—A style of packaging American (cheddar) cheese. An oblong shape weighing approximately 5 pounds.

Pritch pole.—An instrument sharp on both ends, about 36 inches in length, which is used to hold a beef carcass in an upright position on the killing floor during the skinning operation known as "siding."

One end of the pole is placed under the elbow of the carcass, the other end on the roughened surface of the killing bed.

Processed (egg).—An egg which has been treated with an odorless, tasteless, colorless oil (usually mineral oil) to improve the keeping quality.

Processed cheese.—A modified cheese made by comminuting and mixing one or more lots of cheese into a homogenous mass with the aid of heat and with or without the aid of a suitable emulsifying agent or water.

Processed or renovated butter.—The melting, refining, and rechurning, or reworking packing stock or other butter or both.

Processing (canned foods).—The application of heat to foods in sealed cans for the purpose of their sterilization. This "cooking" is done either in open baths at boiling temperature or in closed steam retorts at temperatures higher than boiling.

Pumping.—The intramuscular or intravenous injection of pickle through a hollow needle under pressure into large cuts of meat to facilitate curing.

Quality.—One of the three grading factors of animal carcasses and wholesale cuts of meat. Includes such factors as color, texture, grain, and degree of marbling of the beef, also the color and character of the bones.

Rennet.—A substance found in a calf's stomach that has the properties of coagulating milk.

Ribbing (beef).—The separation of a side of beef into front and hind quarters; usually done between the twelfth and thirteenth ribs.

Roasters (chicken).—Young chickens approximately 4 to 8 months old of either sex weighing over 3½ pounds.

Ropy pickle.—Pickle which, due to bacterial action, has become stringy, and sticky; and which possesses a fetid odor when warmed. If allowed to remain in ropy pickle any length of time meat will be spoiled.

Salad oil.—Deodorized and neutralized vegetable oils from which the saturated, more firm fats have been removed.

Salami style sausage.—A dry or summer sausage containing coarsely chopped pork and a small percent of coarsely chopped beef. It is seasoned with spices and garlic.

Salometer.—An instrument for measuring the density or specific gravity of pickle to be used in the curing of meat. This instrument resembles a hydrometer and is graduated in degrees from 0 to 100. When placed in water at 60° F. it registers 0. When placed in a saturated salt solution it registers 100.

Sandblast (*egg*).—The result of cleaning a dirty egg by means of a sandblast.

Sanitary cans.—A can with the ends attached by means of a crimped double seam.

Sausage meat.—Fresh meat, or prepared meat, or a mixture of fresh and prepared meat which is usually comminuted.

Scrapple.—A product consisting of meat and/or meat byproducts mixed with meal or the flour of grain, and cooked with seasoning materials, after which it is poured into a mold.

Scribe cut bellies.—Bellies which have been damaged by the scribe saw at the time the ribs are cut from the loin.

Second pickle.—Pickle that has been previously used for curing meat. As a rule, only pickle from fancy grades of meat is used the second time as during the curing process the strength of the pickle is considerably reduced.

Seedy belly (*pork*).—Bellies with pink or black colored mammary gland tissue adjacent to the teats.

Seeping yolk (*egg*).—One in which the yolk sac is broken and part of the yolk is seeping through into the white.

Shell (*egg*).—The outer covering of an egg. A hard porous calcareous material ranging from white to dark brown in color.

Shoat.—A young swine of either sex usually weighing 60 to 100 pounds.

Short cut ham (*regular cut ham*).—Cut from the hind leg of a hog carcass by removing the foot between the tarsus and the tibia, usually not exposing the marrow of the tibia; and separated from the side by dividing the ilium in the center, allowing the superior part of the ilium (the slip bone) to remain on the loin. The point of division is about 2½ inches in front of the exposed end of the aitch bone.

Short cut tongue (*beef*).—A tongue cut just posterior to the epiglottis. They weigh from 3½ to 5 pounds. These tongues are trimmed free of all fat, fascia, lymph glands, etc., and are usually sold fresh.

Short vacuum cans.—A can which has not been completely exhausted of air.

Shrinkage (*live stock*).—The difference in the live weight of any animal between the time of shipment and the time of arrival at destination. The amount of shrinkage will depend upon length of time in transit, climatic conditions, etc.

Shrinkage (*meat*).—The loss of weight during storage or processing.

Sinker (*hog*).—A properly slaughtered hog that sinks to the bottom of the scalding vat instead of floating as is usual. Often badly damaged due to partial cooking.

Sirlion strip (beef).—A short loin from which the bones and tenderloin have been removed.

Skewer.—A wooden or metal pin used to fasten meat.

Skim milk.—That portion of the milk that remains after the removal of the cream. Consists of protein, lactose, minerals, and water.

Skinned ham.—One from which the skin has been removed down to within 4 inches of the shank.

Skirt (beef).—That portion of the diaphragm remaining in a side of beef after it has been dressed.

Slaughter cattle.—Mature cattle of beef type that have sufficient size and finish to send to the killer profitably. They usually have been fed on concentrates for from 60 to 120 days or longer.

Slip joint.—Sacro-iliac articulation.

Slow leaker cans.—Cans which have small leaks through which air gains entrance. These slow leaks are often very hard to locate. Such cans show loose tin; that is, the sides are not concaved and tight as with a normal can. By squeezing the sides of the can the contents may be forced through the leak.

Smithfield hams.—Hams processed at Smithfield, Virginia, *only*, by dry cure, heavy smoke, and liberal coating of pepper on outside. Usually produced from peanut fed hogs and trimmed very rough. extra long cut. Hams cured after this procedure elsewhere are called Smithfield style hams.

Smoked meat.—The product obtained by subjecting fresh meat, dried meat, or cured meat to the direct action of smoke, either by burning wood or sawdust.

Souse.—A product consisting of meat and/or meat byproducts. After cooking, the mixture is commonly packed in containers and covered with vinegar.

Sow.—An adult female swine that has given birth to (farrowed) one or more litters of pigs. Corresponds to a cow.

Spare ribs (pork).—The ribs cut from the belly of pork. Half sheets are the rib ends with a portion of the costal cartilages, cut from the rib belly after the loin has been removed. Full sheets are the entire ribs cut from a side.

Spayed heifer.—A young female bovine that has had the ovaries removed before reaching sexual maturity.

Spencer roll (beef).—A boneless cut of beef taken from a canner style cut rib (nine ribs wide) with the wings removed 1 inch from the eye; all ligimentous strips, fat, and fingers removed. Used as steaks or roast.

Spotter.—A term applied to beef carcasses, the muscles of which are spotted with small circumscribed areas of blood due to incomplete bleeding of the animal at the time of slaughter.

Spring lambs.—The carcasses of young lambs of light weight, grain fed, of good quality, usually produced from animals under 8 months of age.

Springer (cow).—A female bovine during the last 2 months of pregnancy.

Springers (cans).—A can with one end bulging. Under pressure the bulge flattens with simultaneous bulging of the opposite end.

Square prints (cheese).—A style of packaging American (cheddar) cheese. An oblong shape weighing approximately 10 pounds each.

Stag (beef).—A mature male bovine that has been castrated after reaching sexual maturity.

Stag (hog).—A mature male swine that has been castrated after reaching sexual maturity. Corresponds to stag in beef.

Stags (chicken).—Male birds of any weight or age with comb and spur development showing the bird to be in a state of maturity between roasting chickens and cocks.

Standard cut ham.—A ham produced by separation from the side not more than approximately 2½ inches from the exposed end of the "aitch" bone. The foot is removed at or above the hock joint.

Stearin.—A pearly-white substance forming the chief solid constituent of many animal and vegetable fats. It is composed of glycerin and stearic acid.

Steer (beef).—A mature male bovine that has been castrated before reaching sexual maturity.

Sterilamps.—Ultra violet producing lamps used for the control of bacteria while meat is aged for a short time at high temperature.

Stocker cattle.—Young beef type cattle that have neither size nor finish to feed profitably but must be carried along for some months on cheap feed such as grass until they develop in size and bone structure.

Storage egg.—Eggs put up for storage. Usually those which have been in storage 30 days or longer.

Strubite (ammonium magnesium phosphate).—A crystallization of certain chemical compounds incidental to canned marine products such as shrimp, haddock, codfish, etc. Appears like particles of glass and sharp enough to cause severe lacerations of the oral cavity. Products containing "strubite" are unfit for human consumption. The crystallization only occurs after canning; and is most frequently observed in old packs.

Stuck yolk (*egg*).—A yolk which has adhered to the shell and maintains a fixed position at that point. Eggs with stuck yolks are inedible.

Suet.—Animal fat. Usually qualified as "beef suet," "mutton suet," etc.

Summer sausage.—Another name for dry sausage. Cervelat style and salami style sausage are examples.

Sweet breads (*calves*).—The thymus gland of a calf. Composed of two portions, the cervical and thoracic. It weighs from 2 to 3 pounds and atrophies as sexual maturity develops.

Sweet (*unsalted*) *butter.*—Butter to which no salt has been added.

Sweet cream butter.—Butter made of sweet cream in the same manner that ordinary butter is made of cream that has soured on account of age.

Sweetened condensed milk.—The product resulting from the evaporation of a considerable portion of the water from whole milk; and with the addition of sugar or dextrose. Average composition: 8 percent milk fat; 20 percent fat free milk solids; 42 percent sugar; 30 percent water.

Sweetened condensed skim milk.—The product resulting from the evaporation of a considerable portion of the water from skim milk to which sugar or dextrose has been added. Average composition: 27 percent fat free milk solids; 43 percent sugar; 30 percent water; and a trace of milk fat.

Sweet pickled meat.—A prepared meat which has been cured in a solution of common salt and any combination of nitrates, nitrites, and sugar.

Swells (*canned food*).—A can with both ends bulged.

Swiss cheese.—A hard, mild cheese which carries very little color. Made by adding a starter of the "bulgaricus" group of bacteria to milk. Characterized by numerous gas holes from the size of a dime to a quarter, due to the propionic acid producing bacteria. The size and shape of the gas holes indicate the state of ripening which the cheese has attained.

Switzer (*cheese*).—A trade name for American made swiss cheese.

Table or coffee cream.—Cream which contains not less than 18 percent milk fat, according to Federal specifications.

Tenderloin (*beef*)—*filet mignon.*—A standard cut of boneless beef. Cut from just under the back bone of a full loin. It is a long oval strip of lean beef, thin on one end and much heavier on the other. Weighs from 4 to 8 pounds and used for steaks and roasts.

Thuringer sausage.—A dry summer sausage usually composed of 25 percent pork and 75 percent beef. It does not contain garlic.

Triangle (*lamb*).—That portion of a lamb remaining after a long cut saddle has been removed. The triangle consists of the flank, plate, brisket, fore shank, shoulder, and neck. This is the portion of a lamb, with the exception of the shoulder, that is usually used for stewing purposes.

Trichinosis.—An infestation of the muscles of a hog with the larva of "trichenalla spiralis," a round worm directly transmissible to man.

Tripe.—Consists of the bovine paunch or rumen; and honey comb or reticulum; properly cleaned, denuded, and washed.

Udder.—The milk gland or mammary gland of a female animal.

Veal.—Meat derived from young bovines of either sex which have been fed largely on milk diet and are usually from 1 to 3 months old.

Venison.—Flesh derived from deer.

Vent leaks.—Leaks in the solder filling the vent of a can. Often these leaks are very minute.

Viscera.—Viscera includes all organs of the abdominal and thoracic cavity.

Weasands (*beef*) (*oesophagus*).—The inner or muscous layer of the oesophagus tied at both ends and used for high-grade bolognas and summer sausages.

Wether (*sheep*).—A young male sheep that has been castrated before reaching sexual maturity. Corresponds to steer.

Whey.—The product remaining after the removal of fat and casein from milk in the process of cheese making.

Whipping cream.—Cream which contains not less than 30 percent milk fat, according to Federal specifications. (Most city ordinances require whipping cream to contain 40 percent milk fat.)

White (*egg*).—A fairly firm gelatin-like substance composed of a fine network of interlacing fibers inclosing protein and water. At either pole there is a dense, opaque, twisted, cord-like coil of white substance called "chalazae" which extends from the yolk membrane to the egg membrane.

Wiltshire sides (*pork*).—Includes the ham, full side, and shoulder, all in one piece. An export cut.

Yolk (*egg*).—The yolk of an egg consists of white and yellow layers composed of fat, protein, and water inclosed in a delicate yolk or vitelline membrane. It floats in the egg white, is suspended by the chalazae, and is light yellow to golden orange in color.

Young American (*cheese*).—A style of packaging American (cheddar) cheese. A small cylinder of cheese about 8 inches in diameter and 12 inches in height and weighing 10 to 11½ pounds.

[A. G. 062.11 (2–3–42).] (C 1, July 13, 1942.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

U. S. GOVERNMENT PRINTING OFFICE: 1942

TECHNICAL MANUAL

MEDICAL DEPARTMENT SOLDIER'S HANDBOOK

CHANGE No. 2

WAR DEPARTMENT,
WASHINGTON, May 20, 1943.

TM 8-220, March 5, 1941, is changed as follows:

145. Asphyxia.

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b. Artificial respiration.

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(6) Keep up artificial respiration without stopping for 2 hours or longer, unless the person to whom it is being given begins to breathe normally before then or is declared by a medical officer to be dead.

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[A. G. 062.11 (4-20-43).] (C 2, May 20, 1943.)

252. Field water supplies.

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e. Purification.

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(2) *Boiling.*—Boiling is the safest method, but is undesirable because of the flat taste and because of the lack of containers for boiling other than small quantities. **One minute of boiling is required for sterilization of water but care must be taken to see that the water actually boils for 1 minute. Aeration of the water by pouring it through the air from one receptacle into another will eliminate the flat taste due to boiling.**

(3) *Chlorination.*—Chlorination is the choice method and may be carried out in the water sterilizing bag (**Lyster** bag), in water carts, in small reservoirs, or by the purification units operated by the Corps of Engineers. The exact amount * * * does clear water.

(*a*) *Water sterilizing bag method.*

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7. (As changed by C 1.) When especially trained * * * onto the ground.

Determine the presence of free chlorine in the water by one of the following methods:

(*a*) *Liquid orthotolidine method.*—Fill a clean canteen cup to a depth of ½ inch of water from the same faucet. Add 1 cc of orthotolidine testing solution to the water in the cup. Wait 5 minutes and note the color produced. Below is a guide for reading the color reaction between the free chlorine and orthotolidine:

(1) *No color.*—Insufficient chlorination. Add more calcium hypochlorite.

(2) *Canary yellow.*—Insufficient chlorination. Add more calcium hypochlorite.

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(3) *Deep yellow.*—Satisfactory chlorination. This represents about one part per million (ppm) of chlorine.

(4) *Orange red.*—Overchlorinated. Add more water and retest.

(5) *Bluish green.*—Alkaline or hard water. Add a few more drops of orthotolidine to get a correct color reading.

(*b*) *Orthotolidine tablet method.*—Remove the inner vial from the testing kit and fill the outer vial with a water sample from the same faucet to the bottom of the colored band. The inner vial contains orthotolidine testing tablets; drop one of these tablets into the sample and shake until dissolved. Note the color produced.

(1) *Equal or darker yellow than the colored band.*—Satisfactory chlorination. Wait 30 minutes before drinking.

(2) *Lighter yellow than the colored band.*—Insufficient chlorination. Add more calcium hypochlorite to the water being treated; wait 10 minutes and retest.

(3) *Orange color.*—Water is overchlorinated. Add more water to the water being treated; wait 10 minutes and retest.

(*c*) *Directions.*—The directions for testing for free chlorine by the above methods are outlined on the bottle of liquid orthotolidine and on the kit containing the orthotolidine testing tablets.

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(c) Technique for individually disinfecting water.

1. Water may be purified in the issue canteen by the use of individual water purification tablets. Since these tablets may be supplied in either 4- or 8-milligram size, the number of tablets to be added to a canteen full of water varies. Directions must be followed as given on the container for these tablets. Two of the 4 milligram tablets are required per quart of clear water, while only one of the 8 milligram tablets is required per quart of clear water. If the water is turbid or colored, two of the 8 milligram tablets or four of the 4 milligram tablets will be required to disinfect it. As chemicals always require time to kill germs, it is imperative that at least 30 minutes elapse after adding the tablets before drinking the water.

2. **If the individual purification tablets are not available, water may be purified in canteens by using the same powder (calcium hypochlorite) as is used in the Lyster bag. One ampule of grade A calcium hypochlorite is dissolved in a canteen of water. This strong solution is then used to purify water in other canteens. The cap of a canteen is used as a measure and one canteen capful of the strong solution is added to each canteen full of water to be treated. The water should be well shaken and should not be used until 30 minutes after chlorination.**

(*d*) (Added.) *Measures for disinfecting water in other containers.*

1. If water sterilizing bags are not available, the water may be disinfected in unit water cans or clean, galvanized iron cans, pails, or barrels. A proportional amount of calcium hypochlorite is used and the method of chlorination is the same as with the water sterilization bag.

2. Water may be purified in larger containers by using individual water purification tablets. Chlorination may be done in containers which are larger than the canteen by the addition of the appropriate number of individual water purification tablets. The number of tablets required is calculated on the size of the container in quarts; thus a 10-gallon container will require 40 times as many tablets as a 1-quart canteen.

(*e*) (Added.) *Test for safety.*—A rough test for the safety of water which has previously been treated for 30 minutes by one of the acceptable chlorination methods is the presence of an odor or taste of chlorine in the water. If chlorine can be tasted or smelled, this indicates the presence of at least 0.4 part per million of available chlorine and the water is safe. In performing this test, precaution must be taken to determine that the odor or taste comes from the treated water and not from a contaminated container or the hands.

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[A. G. 062.11 (4-20-43).] (C 2, May 20, 1943.)

253. Disposal of wastes.

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d. Latrines.—The following general guides apply to latrines constructed in **bivouacs and temporary or semipermanent camps.**

(1) Latrines are company installations maintained by the personnel of the company concerned. **They should be used for the disposal of human wastes and under no condition should fouling of the ground be tolerated.**

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(6) Latrines should be **filled and mounded up with dirt** when closed. **They should be placarded to show the date of closing.**

* * * * * * *

e. Construction and care of latrines.—(1) *General.*—The primary objectives in all types of latrines are to control nuisances and to prevent access of flies to human excreta. **The care of all latrines is similar to above.**

(2) *Shallow trench.*

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(*b*) Shallow trenches should be closed by refilling with earth when the contents have reached within 1 foot of the surface of the ground.

(3) *Deep pit.*

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(*c*) Pit latrines must * * * of the area. The earth is replaced, tamped down, and more oil added. If burlap is not available, oil alone may be used **by mixing earth with crude oil and tamping the earth down.** If oil is not obtainable, the earth may be hardened by moistening with water and tapping. Earth should be tightly packed around the edges of the box to seal all openings to the pit.

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(*e*) Latrines must be kept clean and free from odors. Lime is of no practical value in latrine pits except as a deodorant. The burning out of latrine pits is not advisable since it does not accomplish incineration of excreta and does interfere with measures taken for making the pit and box flyproof. Special attention must be given to the cleanliness of urine troughs. Constant attention by a latrine orderly is necessary for proper care of latrines. The following points are particularly important:

1. **The seats should be scrubbed daily with soap and water. They should be dried after cleaning.**

2. **The seats should be scrubbed twice a week with a 2 percent cresol solution.**

* * * * * * *

(*f*) Deep pit latrines should be closed when filled to within 2 feet of the surface. The box should be removed, the pit contents sprayed with crude oil and covered with burlap, and the pit filled with dirt domed 12 to 18 inches above surface. The site should be placarded with the date of closure. The same spot should not be used again for at least 1 year.

(4) **Pail latrines.** * * *.

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[A. G. 062.11 (4-20-43).] (C 2, May 20, 1943.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:
J. A. ULIO,
Major General,
The Adjutant General.

U. S. GOVERNMENT PRINTING OFFICE: 1943

TECHNICAL MANUAL

MEDICAL DEPARTMENT SOLDIER'S HANDBOOK

CHANGES No. 3 } 105 WAR DEPARTMENT,
WASHINGTON 25, D. C., 25 February 1944.

TM 8-220, 5 March 1941, is changed as follows:

131. Army hinged half-ring leg splint.

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b. (Superseded) *Application.*—In training, the Army leg splint is applied in 10 distinct steps. Under field conditions, the application is performed as one continuous operation, but the same sequence of steps is followed. A team of four men is required in demonstrating the application of the Army leg splint—one man to serve as patient (No. 4 man), one as operator (No. 1), and two as assistants (Nos. 2 and 3).

c. The equipment required for each team is as follows:

* * * * * * *

(9) One litter bar.

(10) Six triangular bandages.

d. The 10 steps are as follows:

(1) Dress litter.

(2) **Apply traction strap. Initiate traction.**

(3) Dress wound.

(4) Apply splint **and secure traction strap.**

(5) **Splint support.**

(6) **Support leg.**

(7) Footrest.

(8) **Place patient on dressed litter.**

(9) Fix splint **with litter bar.**

(10) Cover patient.

e. The procedure is as follows:

(1) *Step No. 1. Dress litter.*—The litter is * * * sides of the litter. The third blanket is **folded to form a pillow for the patient, if the latter is not in shock, and is used as a pillow until the last step.**

(2) (Superseded.) *Step No. 2. Apply traction strap. Initiate traction.*—The No. 2 man applies the adjustable traction strap to the foot of the injured limb without moving the foot and without removing the shoe. The loop is slipped over the toes and the forward half of the foot encircling it at the instep in such a way that the swivel is under the foot just in front of the shoe heel and the buckle rests at one side of the ankle. The retention strap is passed back of the ankle and secured in the buckle. The No. 1 man takes the Army leg

***This change is printed as a pamphlet to conserve paper and printing and to expedite delivery to the field.**

573038°—44

splint and adjusts it, placing the half-ring at a right angle to the rods of the splint so that when applied the short rod of the splint will be on the inner side of the leg and the concavity of the ring will be directed upward. In order to effect this, he places the splint alongside the injured leg, with the ring near the hip, the shorter rod down, and the concavity of the ring directed toward the injured leg. For an injured left leg the No. 2 man places his right hand between the rods of the leg splint and grasps the heel. He grasps the toe with his left hand and, keeping his arms straight at the elbows, exerts a steady pull to produce the necessary traction. This manual traction must be continued even after the traction strap has been secured to the end of the leg splint until step No. 6 is completed. For an injured right leg the No. 2 man reverses the above order in use of hands. Then the No. 3 man slides his hands under the calf and thigh of the injured leg to support it until the supporting bandages have been applied in step No. 6.

(3) (Superseded.) *Step No. 3. Dress wound.*—The No. 1 man inspects the wound and applies an occlusive sterile dressing. Nos. 2 and 3 men cautiously raise the injured leg high enough to allow the No. 1 man to apply the dressing and to inspect and dress any wound on the under surface of the leg.

(4) (Superseded.) *Step No. 4. Apply splint and secure traction strap.*—No. 1 man applies the Army leg splint to the injured leg by rolling it under the leg and thigh from without inward, the short rod to the inner side. The half-ring, with the concavity directed upward, is pushed firmly against the buttock (tuberosity of the ischium) in order to effect countertraction. When the splint is correctly placed, the No. 1 man secures it by buckling the web strap. Fixed traction is then effected in the following manner: No. 1 grasps the free end of the long traction strap, brings it down over the notched end of the splint, then folds it back upon itself and inserts it through the metal ring of the swivel. He then pulls on the free end of the strap until the required traction is obtained. He then secures it to the notched end of the splint with an ordinary cinch knot.

(5) (Superseded.) *Step No. 5. Splint support.*—No. 1 man fastens the splint support to the side rods of the Army leg splint with the arms of the support directed toward the patient. No. 2 man continues to maintain manual traction. No. 3 continues to support the leg and thigh.

(6) (Superseded.) *Step No. 6. Support leg.*—For this purpose five bandages, triangular, compressed, are used—not the heavy triangular bandage with tape ties used as arm slings. They are used unrolled but not unfolded. No. 1 arranges five compressed triangular bandages, unrolled but not unfolded, on the splint to form a cradle for

the leg. These are all applied in like fashion as follows: the bandage is placed over the rods of the splint and under the leg. The ends of the bandages are reversed by crossing them under the splint, and are then brought up and over the rods of the splint and tied together over the outer rod. The bandages are arranged two under the thigh, one under the knee, and two under the leg. This relieves the No. 2 man to assist in other steps.

(7) (Superseded.) *Step No. 7. Footrest.*—The footrest is attached to the rods of the splint just below the foot, with the base (or closed end) of the support directed upward and the arms directed away from the patient. The footrest is pushed up against the foot until the foot is at right angles to the leg. The foot is then secured to the footrest by means of a triangular bandage in order to support and fix the foot in its proper position and to prevent foot drop.

(8) (Superseded.) *Step No. 8. Place patient on dressed litter.*—Nos. 2 and 3 take their positions alongside the patient on the side of the injured leg, No. 2 toward the head of the patient, No. 3 toward the feet. No. 1 assists from the opposite (uninjured) side. All three men kneel on that knee which is nearer the patient's feet. No. 3 passes both forearms under the patient's legs, carefully supporting the splinted leg. No. 2 passes one hand under the patient's hips and thighs, and the other hand under the patient's shoulders. All lift together slowly and carefully, and place the patient upon the knees of the Nos. 2 and 3 men. No. 1 man relinquishes his hold and slides the dressed litter underneath the patient. No. 1 resumes his former kneeling position opposite Nos. 2 and 3 and the patient is gently lowered upon the dressed litter in such a way that the base of the splint support rests upon the canvas of the litter about 1½ inches from its lower edge.

(9) (Superseded.) *Step No. 9. Fix splint with litter bar.*—(*a*) No. 3 man holds up the distal end of the splint so that the base of the splint support is about 3 inches off the canvas of the litter. No. 2 passes the litter bar under the litter to the No. 1 man, who places the litter bar across the lower end of the litter resting on both poles. The grooved surface is directed upward and its cam end is on the side of the injured leg and allows the base of the splint support to rest easily in the groove. The cam lock handle will be on the side of the bar toward the patient when the left leg is splinted and on the side away from the patient when the right leg is splinted. No. 2 secures the bar tightly on the litter by fastening the buckle to the litter bar. He locks the buckle in place by hooking the catch on its under surface on the side of the litter bar. The buckle should be so adjusted on the securing strap that when buckled, the securing strap is under considerable tension, sufficient to prevent any movement of the bar on the litter. No. 1 fastens the cam

lock, thus fixing the base of the splint support securely in the groove of the litter bar.

(*b*) If a litter bar is not available, a roll of bias muslin bandage may be used to fix the splint. This is done by tying one end of the bandage to the litter stirrup on the side of the fracture, carrying the bandage to the bevel of the handle close to the canvas, and winding it around the handle twice. The bandage is then carried to the near rod of the leg splint, wound around the rod twice, and carried back and around the same handle. The splint is pressed down firmly on the litter and constant pull continued on the bandage until all the slack in the bandage going from the litter to the splint and from the splint back to the litter is taken up. The bandage is next carried across the litter to the bevel of the opposite handle. The bandage is wound around the handle twice and the far rod of the splint secured in the same manner as was done on the near side. The step is completed by tying the bandage to the opposite stirrup. (See fig. 46.)

(10) (Superseded.) *Step No. 10. Cover patient.*—Nos. 2 and 3 men fold the third blanket once lengthwise and place it on the patient so that one edge is under his chin. The free edges of the first two blankets are folded over the third and secured in place, using three safetypins to the body portion, and three to the portion of the blankets inclosing the patient's feet and lower end of the splint. This gives four thicknesses of blankets over and four under the patient, thus assisting in the prevention of shock by conserving the patient's body heat. The leg splint is now properly applied and the patient ready for transportation.

(11) *Alternate Step* **No.** *2.*—In the absence of the traction strap, the following may be substituted for step **No. 2:**

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[A. G. 300.7 (23 Dec 43).] (C 3, 25 Feb 44.)

148. Injuries due to cold (Superseded.).—*a. Frostbite.*—Frostbite and freezing are terms applied to freezing or the local effect of freezing in some part of the body. The effects of frostbite lead to an inflammatory condition very similar to that seen in burns. Thawing is followed by a reaction due to the increase of circulation in the affected parts. The intensity of this reaction depends principally upon the degree and duration of exposure to cold and the rate at which the temperature of the part is raised. If the temperature of the part is raised too rapidly, great harm may be done to the injured part. Frostbite may develop suddenly by direct exposure of bared parts during extreme cold, or it may develop gradually by prolonged exposure of clothed parts.

(1) *Parts affected and methods of detaching.*—(*a*) The parts most frequently affected are the fingers, ears, nose, feet, cheeks, chin, and forehead.

(*b*) A grayish or whitish waxy appearance of the skin is an early sign of frostbite.

(*c*) Sometimes there is loss of sensation in the affected parts, hence pain may or may not be present.

(*d*) In some cases, there is a local burning or stinging sensation followed by numbness.

(*e*) In the affected part, a small area may be observed which may be hard and immovable.

(*f*) Men should frequently examine their own exposed parts and those of their companions for signs of frostbite.

(*g*) In very cold weather, stiffness caused by freezing can be detected by wrinkling the face from time to time.

(2) *Protective measures.*—The following protective measures will assist in conserving body heat and maintaining circulation:

(*a*) Wearing proper clothing, mittens or gloves, head gear and foot gear.

(*b*) Avoiding excessive clothing, especially while actively exercising, since perspiration is conducive to frostbite. It may be necessary to remove parka hoods temporarily and to change the amount of clothing several times a day, depending upon the degree of cold and extent of activity. Clothing which has become damp should be changed as soon as possible.

(*c*) Protecting the face from cold winds by pulling the parka hood or coat forward on the windward side, or by shielding the face with the mittened hand.

(*d*) Individuals, if possible, should work in groups and watch the faces of their companions for evidence of frostbite.

(*e*) At temperatures below freezing, mittens should be worn in preference to gloves which separate the fingers.

(*f*) All clothing, including gloves, shoes, socks, and leggings should fit loosely to avoid constricting circulation.

(*g*) Pack straps should be placed so that they do not press on the arms or under the armpits.

(*h*) Cramped positions which interfere with circulation should be avoided.

(*i*) The beneficial effect provided by normal skin oil should be preserved by avoiding too frequent washing.

(*j*) Prevent freezing of the penis when urinating by protecting it from the wind and afterwards by carefully buttoning the clothes.

(*k*) Do not touch cold metal such as a metal canteen cap or mouthpiece with the bare hands, tongue, or lips, as the skin immediately freezes to such surfaces and will be pulled off by the cold metal. Objects which require such contact, such as metal whistles and mouth-

pieces of bugles, should be carried in a pocket near the body to keep them warm.

(*l*) Do not eat snow or ice; to do so may cause freezing of the lips and tongue. Snow or ice which is to be used to quench the thirst should be melted. Melted ice or snow should be purified before drinking.

(*m*) Hot food and drinks, at frequent intervals, are helpful, but smoking and alcoholic drinks should be avoided.

(3) *Emergency treatment.*—(*a*) Thaw a frostbitten or frozen part slowly. Thawing can be done best by applying the bared part to a warm part of the person's own body or to a warm part of the body of another person; and then covering it with blankets or extra clothing.

(*b*) Do not bring a frostbitten or frozen part close to a fire or anything hot. If a person who has been frostbitten is brought indoors, the room into which he is brought should be only moderately warm.

(*c*) If during or shortly after thawing, pain becomes too severe, thawing should be slowed by exposing the part to cool air or water.

(*d*) Wrap the person in warm blankets and give hot nonalcoholic drinks, and treat for shock if necessary.

(*e*) After thawing, keep the part at absolute rest and, if an arm or leg, slightly raised. A hand which has been frostbitten or frozen should be carried in a sling. No weight should be borne on feet that have been frostbitten or frozen.

(*f*) Do not rub a frostbitten part and do not bend frozen limbs or ears, as this will cause further injury to the already damaged tissues. It is especially important not to rub or put snow or ice on a frostbitten or frozen part of the body, as this will increase the freezing.

(*g*) In severe frostbite or freezing, even the gentlest massage can do great harm.

(*h*) After thawing, wrap the part lightly with sterile dressings, keep it at a reasonably cool temperature, and keep heavy covers from pressing on it. Local medication should be avoided.

(*i*) Thawing is often very painful, especially if a part has frozen hard. The skin becomes red, or in severe cases violet. In time, blisters may appear; these may not show up until several days later and may be of great size. They should not be opened except under the supervision of a medical officer.

(*j*) Cover all blisters, open sores, or darkened areas of skin with sterile dressings.

b. Immersion foot.—(1) *General.*—Immersion foot results from prolonged wetting and chilling of the feet. This condition may also affect other parts of the body as the hands, knees, and buttocks.

(2) *Contributing factors.*

(*a*) Immobility of the feet and legs.

(*b*) Total immersion or repeated soakings.

(*c*) Body chilling, as from wind.

(*d*) Inadequate clothing.

(*e*) Seasickness and starvation.

(*f*) Lowered morale.

(3) *Signs and symptoms.*—Part or all of the following signs or symptoms may be present:

(*a*) Numbness or clumsy sensation in feet and legs.

(*b*) Pain, tingling and itching are usually absent.

(*c*) Cramps, usually in the calves.

(*d*) Swelling of the feet.

(*e*) Discoloration of the skin.

(4) *Preventive measures.*—(*a*) Use every available means to keep the body dry and warm.

(*b*) Avoid cramped positions.

(*c*) Exercise frequently, especially the extremities to assist circulation. Temporary elevation of the feet is of aid in this respect.

(*d*) Tight clothing, leggings, shoes, and socks should be avoided.

(*e*) If feet become wet, remove the shoes and socks, dry the feet, and if possible apply oil, vaseline, or heavy grease. Shoes and socks should be well dried before being replaced.

(*f*) Nutrition should be maintained at as high a level as circumstances permit. All alcoholic beverages should be avoided.

(5) *Emergency treatment.*—(*a*) At time of rescue, the injured person should not be permitted to walk on damaged feet. If movement is necessary, the patient should be carried.

(*b*) Remove wet clothing and wrap patient in warm blankets, leaving injured extremities exposed to the air in a moderately cool room.

(*c*) The involved extremities should be handled very gently. Do not rub or massage the limbs. If necessary, the feet may be cleansed with soap and cool water, dried, then allowed to remain exposed and elevated on pillows. While it is desirable to warm the patient, the feet should always be kept cool by exposure to the room air.

(*d*) The back of the legs down to the ankles should be supported on pillows.

(*e*) During evacuation, protect against infection by covering feet with sterile, or at least clean, towels or sheets.

[A. G. 300.7 (23 Dec 43).] (C 3, 25 Feb 44.)

249. Control measures.

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*c. **Proper bed spacing.***—(1) (Superseded.) In barracks, each man should have a floor space of 60 square feet and air space of 720 cubic feet. With double decker bunks the standard should be 100 square feet of floor space and 1,400 cubic feet of air space per bed. In order to conserve critical material and to use all existing construc-

tion to the fullest extent, space allotments for troop housing will be reduced to 40 square feet per man whenever such action will eliminate or reduce the necessity for additional construction. However, due to the special health problems at replacement training centers, reception and induction centers, and schools, a minimum of 50 square feet per man will be maintained and the reduction to 40 square feet per man will not be made except for a temporary period to meet an extreme emergency. In computing the area per man, the space allotted to hallways, entrances, washrooms, and latrines will not be included in the square footage available for troops. With an allowance of 60 square feet per man, there exists 6 feet distance between the heads of the men. The new authorized capacity for pyramidal tents will be 6 men, and for temporary emergency, eight. Capacity for hutments will be 18 men; for temporary emergency occupancy, 22 men. Beds should at all times be so arranged that there is head-to-foot sleeping. When necessary, staggering of beds will aid in securing the desired distance between the heads of men.

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d. Proper barracks sanitation * * * must be prohibited. An ample supply of cuspidors containing a **diluted solution of quartermaster disinfectant** to a depth of 1 to 2 inches is important. Cuspidors must be cleaned daily. Bedding should be aired twice weekly. Beds should be cleaned with soap and water at frequent intervals.

e. Mess gear and utensils should be thoroughly disinfected. Any food handlers showing evidence of respiratory **or other infectious** disease should be promptly relieved from duty.

[A. G. 300.7 (23 Dec 43).] (C 3, 25 Feb 44.)

252. Field water supplies.

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e. Purification.

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4. Rescinded.

[A. G. 300.7 (23 Dec 43).] (C 3, 25 Feb 44.)

253. Disposal of wastes.

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e. Construction and care of latrines.

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(3) *Deep pit.*

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(*e*) (As changed by C 2.) Latrines must be * * * are particularly important:

1. The seats should be scrubbed daily with soap and water. They should be dried after cleaning.

2. **The urine troughs should be scrubbed daily with soap and water.**

3. The seat covers should be kept closed when not in use.
4. The box should be kept flytight by repairing it as necessary.
5. Fly traps should be placed near each latrine.
6. An ample supply of toilet paper should be available.

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(4) *Pail latrines.*—If the character * * * outside the building. The pails must be removed and emptied daily, being replaced by clean pails, the bottom of which should contain about 1 inch of a **diluted solution of quartermaster disinfectant.** The latrine box * * * a nearby sewer.

f. Urine trough and soakage pit.

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(2) *Soakage pit.*—If the latrine * * * of 5 per 100 men. A soakage pit should serve **100** men indefinitely. When it is * * * dirt and sod.

g. Night urinal cans.—If the distance to the latrines is considerable, a large can or pail with 1 inch of **diluted solution of quartermaster disinfectant** should be placed at the end of each company street at night, for use as a urinal. Each morning the * * * then be washed.

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[A. G. 300.7 (23 Dec 43).] (C 3, 25 Feb 44.)

255. Mess sanitation.

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b. Food handlers.

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(2) *Examination.*—Army Regulations require that such permanent food handlers, **civilian as well as military personnel,** be examined by a medical officer before beginning duty in the mess, and each **month** thereafter. The purpose of * * * in the mess.

(3) *Daily* ***inspection.***—Temporary kitchen police are not routinely required to have food handler examinations. However, it is vitally important that both the temporary kitchen police and the permanent food handlers be closely **inspected at** all times for evidence of communicable diseases. This is a responsibility of **company commanders. Messes should be inspected at odd hours of the day, preferably just before or after a meal, and inspections should usually be informal and unscheduled.** Any food handler, temporary or permanent, showing evidence of an illness, particularly of a cold or other respiratory disease, or of diarrhea or other intestinal disease, **or of boils, carbuncles, or other skin infection** should be promptly relieved from duty **and instructed to report to the medical officer.**

(4) *Cleanliness.*—It is equally * * * must be provided.

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e. Food preparation (Superseded).—(1) If the mess is to fulfill its function in the promotion of health, physical fitness and the maintenance of morale, it must provide adequate meals presented through menus of suitable variety that cater to the food habits of the group. Variety is of prime importance and can be obtained by good cooking and in interesting and varied methods of preparation fully as well as from different kinds of food. Overcooking, preparation too long before meal time, and long standing before serving reduces the attractiveness and especially the nutritive value (vitamin content) of food.

(2) Thorough cooking and immediate serving after cooking are the best safeguards against the transmission of communicable diseases by food, provided care is taken not to contaminate the food after cooking.

(3) Disease-producing organisms will multiply rapidly in many cooked foods even when placed in the ordinary ice box or refrigerator. The use of left-over food should be reduced to a minimum. This is particularly true in case of meat hash, sausage, fresh pork, veal, meat broth or soups, or dishes containing a preponderance of these materials. These foods will not be served as left-overs without adequate reheating. Protein foods, salads, puddings, custards, cream fillings and sauces will not be prepared more than 4 hours before serving, preferably just prior to serving. Such foods, unless hot, should be kept in shallow pans in the refrigerator until time for serving. Sliced cooked meats, ground meats, ground cheese, ground boiled eggs, or peeled eggs coming in contact with the hands of kitchen help should be prepared just before cooking and serving. The placing of this type of food in deep containers in refrigeraors is dangerous. The use of ground meat and egg or cheese spreads as sandwich fillers is dangerous unless prepared just prior to serving. Sandwiches to be issued to troops in the field should be generally of nonprotein foods unless adequate amounts of ground pickle mixture containing vinegar are used as a filler. They should be prepared as near as possible to the time of consumption. Sandwiches with a filler made of jelly, jam, butter, sliced cheese, and sliced meat, providing that no mayonnaise or other cooked dressing is used and the meat and cheese are covered on both sides with a ground pickle mixture containing vinegar, are the preferable types to serve.

(4) All vegetables that are to be eaten raw and which cannot be peeled, should be thoroughly washed in running water before serving. This applies particularly to leafy vegetables such as lettuce, greens, and radishes which may have become contaminated with disease-producing organisms from materials used as fertilizers, especially in the Tropics.

f. Care of utensils.—(1) *General* (superseded).—All cooking and eating utensils will be disinfected by washing immediately after use. This is necessary to destroy disease organisms. The utensils will be air-dried. Dish towels will never be used. When not in use all utensils will be protected from dust and flies. One of the following methods for sterlizing utensils will be used:

(*a*) By dishwashing machines in which the washing period is not less than 40 seconds, with the temperature of the wash water held at 140° F. or higher. This must be followed by rinsing for 20 seconds with the water at a temperature of not less than 180° F.

(*b*) In messes where dishwashing machines are not available, the utensils will be thoroughly washed and then carefully rinsed in hot water at 120° to 140° F. Following this they will be rinsed or immersed in hot water for 30 seconds at 180° F. if the heat is controlled by an adequate thermostat or thermometer. If neither a thermostat nor thermometer is available, they will be immersed in boiling water for at least 1 minute and then removed and allowed to air-dry.

(*c*) If suitable and adequate amounts of hot water cannot be obtained to carry out the provisions of (*a*) or (*b*), above, the following procedure may be used: utensils having been thoroughly cleaned by washing and rinsed in water as hot as can be obtained will then be immersed for not less than 30 seconds in a chlorine solution containing at least 50 parts per million of free chlorine or a solution made by dissolving the contents of one box of germicidal rinse in not more than 25 gallons of water. This method will be used only in an emergency.

(2) *Mess kits.*—(*a*) If mess kits * * * strips of metal. **The first can will contain hot soapy water; clear rinse water contained in the second and third will be kept actually boiling during the entire period it is being used.** Each man thoroughly washes his mess equipment in **the** hot soapy water, then rinses it in the **boiling** clear water, and permits it to air-dry. **Towels for the drying of mess kits, knives or forks, will not be used.** The cans must be emptied of water and thoroughly cleansed after each meal. The food particles are disposed of by burial or incineration. The water is disposed of in the soakage pit or trench.

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i. Disposal of garbage (superseded).—Garbage should be collected and disposed of in standard galvanized iron cans equipped with tight fitting metal lids. To minimize danger of spillage during transportation, the cans should not be filled to within 4 inches of the top nor will the garbage be transferred from can to can or from can to cart during collection. The lids should be kept on at all times except when removed to deposit garbage. Garbage cans should be kept outside the mess, either on an approved garbage stand or on firm well-tamped

soil. Garbage stands, if used, should not be screened nor will they be whitewashed. They should be scrubbed daily with a stiff brush and hot soapy water. The adjacent area will be kept sanitary so as not to attract flies. Garbage should be hauled away for incineration or burial at least once a day, and preferably after each meal. The garbage cans should be scoured with hot soapy water and lye at least once each day.

[A. G. 300.7 (23 Dec 43).] (C 3, 25 Feb 44.)

257. Mosquito control.

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e. Control measures.

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(4) *Protection.*

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(*c*) *Repellents* (Superseded).—These are mixtures which when daubed on the skin partially or completely repel mosquitoes. These repellents are now issued and are used as follows: Shake about 12 drops into one hand. Rub hands together, then apply in a thin layer by rubbing until all areas are covered. Apply in a similar manner on clothing where insects are biting through. Apply with caution around eyes and mouth.

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(5) (Added.) *Medicinal prophylaxis* (*suppressive treatment*).—Atabrine and quinine are valuable to suppress clinical symptoms of malaria among troops serving in a region where malaria is highly prevalent and where satisfactory protection from mosquitoes cannot be secured. Drug prophylaxis should, however, be used only as a temporary emergency measure. Drugs should be continued until troops have returned to a sanitated base area where adequate hospital facilities are available. A roster check under supervision of a responsible officer is necessary to insure that the medicine is taken regularly by everyone concerned.

[A. G. 300.7 (23 Dec 43).] (C 3, 25 Feb 44.)

258. Control of lice.

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e. Characteristics.

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(3) Lice and their eggs are killed in 5 minutes by dry heat of 131° F. and in 1 minute at 155° F. They are killed in 30 seconds in boiling water. **Exposure to extreme cold (10° below zero or colder) will kill lice and eggs in 2 hours. Fumigation with methyl bromide gas will kill them in from ½ to 2 hours.**

* * * * * * *

f. Delousing.—(1) Delousing must be universally effective throughout the unit. All individuals, their clothing, and their equip-

ment should be disinfested simultaneously. If one individual is missed, reinfestation of the entire unit will soon occur. **Unit commanders may prevent infestation of their organization by insisting on frequent bathing, use of insecticide powder, change of clothing, and inspection for evidence of lice. Prompt action should be taken at first indication of lice.**

(2) Delousing of a unit includes the following procedures:

(*a*) All individuals to bathe thoroughly and to shave **or clip the hair from** various parts of the body if necessary.

(*b*) **Insecticide powder or louse spray to be applied to hairy parts of body.**

(*c*) **Clothing and equipment to be deloused.**

(*d*) Clean clothing **or disinfested clothing** to be issued to all individuals.

(*e*) **Latrines, beds, and any objects possibly harboring lice to be disinfected or destroyed.**

* * * * * * *

i. Shampooing (Superseded).—If head lice are present, the scalp should be thoroughly shampooed, after which the hair should be dusted with insecticide powder or sprayed with louse spray. If neither is available, disinfestation can be accomplished by loosening the eggs from hairs by the thorough application of vinegar followed by shampooing the scalp with hot, soapy water containing 25 percent of kerosene. This removes the detached eggs and kills the adult and larval forms. After shampooing, the hair should be combed with a fine-toothed comb to remove any nits not removed by washing. Where practicable the hair should be clipped short.

j. Disinfestation of clothing and equipment.—(1) *General.*—Improper treatment will * * * will damage somewhat. **Methyl bromide gas is harmful to neither clothing nor leather.**

* * * * * * *

p. Chemicals (Superseded).—(1) *Insecticide powder.*—Insecticide powder will not only destroy lice that come in contact with it at the time of application, but will continue to destroy all lice that contact it for a period of 7 to 10 days.

(*a*) *Method of using insecticide powder on clothes and body as prophylaxis.*

1. For the body louse, dust lightly the entire inner surface of the undergarments, giving special attention to the seams. The inner seams of the pants and shirt should be treated in a similar manner. Rub the treated areas lightly by hand to spread the powder more evenly. Repeat applications at 1- or 2-week intervals, depending on the need.

2. For control of pubic (crab) lice, apply to all regions of the body where coarse hair is present. On hairy individuals,

crab lice may be scattered over the entire body. Repeat twice at weekly intervals.

(*b*) *Insecticide powder method for treatment of infested material.*—Dust all material lightly with delousing powder giving special care to all seams and crevices in which lice may be lodged. Repeat at 1- or 2-week intervals.

(*c*) *Method of using insecticide powder in billets and other places of habitation.*

1. Thoroughly clean the buildings.

2. Close all doors and windows.

3. A small amount of insecticide powder may be blown into the air of each room by the use of a *dust gun.*

4. Before using rooms, allow one hour for the insecticidal dust to settle into the cracks, crevices, and other places where lice may be lodged.

(2) *Methyl bromide.*—Methyl bromide when used as a fumigant is effective against all stages of the body or clothes louse. Two methods have been developed for delousing clothing: the individual bag method for fumigation of single outfits of clothing in gastight bags; and the vault method for fumigation of quantities of clothing in barrack bags.

(*a*) *Individual bag method.*

1. Procedure.

(a) Place clothing, including shoes and blankets, loosely in the standard Army fumigation bag.

(b) Put one methyl bromide ampule (20 cc.) in the special pocket inside the bag. (Do not remove the cloth covering from the ampule.)

(c) Fold top of bag three times and tie tightly.

(d) Locate the ampule and break it with heel of shoe.

(e) Fumigate 45 minutes at temperature of 60° F. or above. Below 60° F. add ½ hour for each 10° F. drop in temperature as shown by the following table:

50° to 59° F. fumigate for 1¼ hours.
40° to 49° F. fumigate for 1¾ hours.
−09° to +39° F. fumigate for 2¼ hours.

(f) After the required time for fumigation has elapsed, stand on windward side, open bag, and dump contents on floor or ground.

(g) Air clothing for 5 minutes. Then briefly shake each garment before putting on.

2. Precaution.—The gas is injurious if breathed over too long a period. Do all bag fumigation outdoors or in a well-

ventilated building. Never fumigate clothes or air them after fumigation in a closed room where men are present.

3. *Repair of Army fumigation bag.*—A container of special quick-drying paint is provided with each lot of fumigating bags. This is painted on places where seams leak or where the coating has peeled. To patch rips and holes, use a piece of cloth saturated with paint.

(*b*) *Vault method.*—The Quartermaster Corps is responsible for the operation of the gastight vault using methyl bromide. The equipment consists of rectangular vaults of about 330 cubic feet capacity each, set up in batteries. Each unit holds approximately 50 barrack bags of 25 pounds each and 1 hour is necessary for the total operation of loading, fumigating, airing and unloading. Clothing, including shoes and blankets, should be placed loosely in the bags so that the gas will penetrate.

[A. G. 300.7 (23 Dec 43).] (C 3, 25 Feb 44.)

366. *Emergency* treatment of patients injured by blister gases.—(Superseded.) It must be remembered that preventive treatment is very important and in this respect the time element is of paramount importance. Ordinary clothing contaminated with vesicant agents should be removed as early as possible. Protective clothing need be removed only if it is contaminated with large drops or splashes of vesicant agents. Emergency treatment should be given the instant one has become contaminated by a gas.

a. Eyes (Superseded).—(1) *Blister gases in liquid form.*—When a blister gas in liquid form has gotten into the eye causing immediate pain, use BAL ointment. Place some of the ointment into the eye and on the eyelids and gently massage the closed eyelids to spread the ointment over the entire inner surfaces. BAL ointment gives effective relief provided it is used at once when pain is felt.

Caution: When a blister gas has been detected in the eye before pain is felt, do not apply BAL ointment. To do so will cause temporary irritation. When no pain is felt, flushing the eye with plenty of clean water, at least a canteenful, will wash away the gas.

(2) *Blister gases in vapor form.*—In the majority of cases, a blister gas in vapor form has produced its damage before its presence can be detected, therefore all cases of eye injury (known as "Red Eye") from vapor should report to a medical officer for treatment.

b. Breathing passages.—Cases in which * * * the throat (laryngitis). **Emergency treatment** cannot cope with this condition. The patient must be hospitalized as soon as possible.

c. Digestive system.—The pain in the stomach and vomiting can **often** be temporarily relieved by draughts of warm sodium bicar-

bonate (cooking soda), 10 grains to 1 pint of water. Such cases should be hospitalized as soon as possible.

d. Skin.—It is important to * * * that we recognize. There are two measures which may be taken in emergency treatment. The chemical agent may be removed by washing, and it may be neutralized. If the actual liquid has reached the skin, treatment must be begun in less than 2 minutes to be satisfactory. When bleaching powder is used, the most effective method of its application is to make a paste of a small quantity of the bleaching powder with water, the mixture being carefully stirred while being prepared. Usually equal volumes * * * into the eyes. If the skin has already begun to show definite redness or blisters, the protective ointment or bleaching powder should not be used, as it is irritating. **The best treatment for blister gas on the skin is protective ointment. The protective ointment should be used as follows:**

(1) Use quickly, within 1 to 2 minutes from time of exposure. If redness has already developed, do not use protective ointment because at this stage protective ointment is harmful, and thorough washing with water, or better still, soap and water, is the best thing to do.

(2) Tear off small pieces of the cellulose packing material used to wrap the tube of ointment, and blot dry (dab, do not rub) any liquid vesicant agent which may be on the skin. Use a fresh piece of the packing material for each dabbing to avoid spreading the chemical agent.

(3) Unscrew the cap of the tube, reverse it, and use it to punch a hole in the seal of the tube. Squeeze some ointment on a piece of the packing material or fingers and rub the ointment into the contaminated area for about 30 seconds.

(4) Use a clean piece of packing material to wipe off any ointment which is left on the skin. Repeat this procedure. If liquid contamination has been heavy, repeat using fresh amounts of ointment two or three times, wiping off the excess ointment before each new application.

(5) After 10 to 20 minutes, wash away any remaining ointment, using soap and water if possible.

[A. G. 300.7 (23 Dec 43).] (C 3, 25 Feb 44.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:
J. A. ULIO,
Major General,
The Adjutant General.

U. S. GOVERNMENT PRINTING OFFICE: 1944

CHAPTER 1

RULES OF LAND WARFARE

SECTION I

LAWS OF WAR IN GENERAL

1. General.—The laws of war are the well-established and generally recognized rules that regulate the conduct of war both on land and on sea. In this chapter, only such laws as apply to land warfare will be considered.

2. Laws of war.—These include—

a. Unwritten rules not formally agreed upon, although generally observed. Such rules change with the times, as public opinion changes and new means of waging war are devised.

b. Rules agreed upon in international conference binding only those that agree to the rules in writing.

SECTION II

THE HAGUE CONVENTIONS

3. General.—The Hague Convention and several international conferences have been held to consider, among other things, the treatment of prisoners of war and of inhabitants of occupied territory, and the general conduct of hostilities. The last Hague Convention was held in 1907.

4. Declaration of war.—No nation may commence hostilities against another without first making a formal declaration of war.

This law of war is frequently violated today; yet, curiously enough, it was the one rule that the framers of The Hague Conventions agreed upon unanimously. Neutral powers are supposed to be notified of the state of war.

5. **Belligerents and nonbelligerents.**—The laws of war separate the population of a nation at war into two classes—belligerents (those belonging to recognized military forces) and nonbelligerents (the civil population).

a. Belligerents may engage in any of the acts of war recognized as legal by the laws of war without forfeiting protection guaranteed to prisoners of war in case they are captured by the enemy.

b. Nonbelligerents are prohibited from engaging in combat and in other forms of direct action against the enemy except in self-defense. If they violate this law of war and are captured by the enemy, they are not entitled to the protection guaranteed prisoners of war and may be punished.

6. **Prisoners of war.**—Prisoners of war must be treated humanely. They are permitted to keep their personal property, but all military equipment and papers are taken from them. Except commissioned officers, they may be required to work, provided the labor is not excessive and has no connection with military operations. Work connected with the care of the sick and injured has been considered proper, and prisoners of war have been required to assist in medical service. Every prisoner of war is required, when asked, to give his true name and grade, and he may be punished for refusing so to do. *He is not required to name his organization.*

Section III

GENEVA CONVENTION

7. **General.**—The laws of war applying to every aspect of warfare, other than the problems associated with sick and wounded, are included in The Hague Conventions (see sec. II); but The Hague Conventions merely approve the rules established in the Geneva Convention in these words: "The obligations of belligerents in respect to the sick and wounded are regulated by the Geneva Convention."

8. Care of sick and wounded.—Officers, soldiers, and other persons officially attached to armies, who are sick or wounded, will be respected and cared for, *without distinction of nationality*, by the belligerent in whose power they are.

9. Abandonment of sick and wounded.—Whenever it becomes necessary to abandon sick and wounded to the enemy, if military conditions permit, a detachment of medical troops with essential equipment and supplies must be left with the sick and wounded to care for them until the enemy has taken them over.

10. Duties of belligerent after engagement.—After every engagement, the belligerent who remains in possession of the field of battle will take measures to search for the wounded, and to protect the wounded and dead from robbery and ill treatment. He will see that a careful examination is made of the bodies of the dead prior to burial or cremation, and will make every effort to record the identity of dead enemies as well as of his own men.

11. Protection of medical troops and property.—Medical troops, installations, and equipment are to be protected *so long as they are not used to commit acts injurious to the enemy*. This protection is extended to the dental, *but not to the veterinary service.*

12. Medical service emblem.—The distinctive emblem of medical service (the Red, or Geneva, Cross) must be displayed on all flags and brassards, as well as on all equipment, used by the medical service. This emblem cannot be used by any other branch of the military service.

Section IV

VOLUNTARY AID SOCIETIES

13. General.—Voluntary aid societies who provided a great part of care and treatment of the sick and wounded prior to the development of the medical service of the Army, have no responsibility to the Government for such care and they are now restricted for the most part to providing comforts and luxuries not obtainable officially. Their personnel and equipment while so engaged are protected by the Geneva Convention in the same manner, and are subject to the same provisions, as those of the Medical Department. The Medical Department cannot share its responsibility for care or treatment of sick and wounded soldiers with any agency.

14. American National Red Cross.—See AR 850–75.

CHAPTER 2

BASIC ANATOMY AND PHYSIOLOGY

SECTION I

MEDICAL

15. General structure.—The human body consists of a bony or skeletal framework which supports the soft parts or tissues. As a preliminary to the description of the gross appearance of the separate parts of the body it is appropriate that consideration be given to the finer structure of the tissues.

16. Minute anatomy.—*a*. The structural unit of every part of the human body is the microscopic animal cell, and the various activities of the body result from the activities of the cells which compose it.

b. These body cells vary in size and shape, but all are very minute, the largest rarely exceeding one-fifth of a millimeter in diameter. In some parts of the body they lie side by side; in other parts they may be separated from one another to a varying degree by an intercellular substance. They differ greatly in structure and function. muscle cells are long fibers having the power to contract; bone cells form the hardest and most enduring tissue in the body; nerve cells possess elongated processes whose special function is conductivity; the cells of the skin are very flat, especially those comprising the outermost layers, and their function is principally a protective one.

c. A cell may be defined as living matter called *protoplasm*, surrounded by a membrane and containing a smaller, denser inner body called the nucleus or kernel. The protoplasm is a colorless, semitransparent, gelatinous, mobile, and irritable substance which is the "physical basis of life." One of the principal constituent parts of the protoplasm of the nucleus is *chromatin*, which carries all of the hereditary potentialities of the individual and is directly concerned in the reproduction, or division, of the cell.

d. When cells with similar structure and function are grouped together there is formed what is known as *tissue*. Between these cells there are always small spaces even in the most compact tissue. There are points of union between cell and cell, but the

intercellular spaces are necessary in order that each cell may be in contact with the fluids of the body in which nourishment is carried to the cell and waste products are removed. This interchange takes place through the cell membrane.

e. In considering the properties of protoplasm we find that it is a mixture of complex organic and simpler inorganic substances. The organic substances comprise principally proteins, fats, lipoids, and carbohydrates, while the inorganic substances are water and many chemical elements.

f. Protoplasm has the power to absorb oxygen and oxidize, or burn, some of its substance, thus producing heat energy. It is able to take up certain chemical compounds, or non-living materials, as food and convert them into its own substance, causing repair and growth. This power of nutrition is known as metabolism. Protoplasm is irritable and responds to stimulation. It has the capacity for motion.

17. Development of body.—The human body is developed from a single cell called the *ovum.* The ovum divides and subdivides, and the daughter cells thus formed arrange themselves as a membrane comprising three layers of cells. The outer layer is the *ectoderm*, the middle layer the *mesoderm*, and the inner layer, the *entoderm.* These three layers of cells later in the process of development assume different sizes and shapes forming the various types of cells found in the body; for example, from the ectoderm come the skin and nerve cells; the muscle cells derive from the mesoderm; the entoderm provides the lining cells of the intestines. As stated above, collections of cells of like structure and function form tissues. Combinations of tissues form body organs or structures. The characteristics of tissue depend upon the type of cells and the intercellular substance composing it, and the structure of any organ depends upon the properties of the tissue of which it is composed.

18. Varieties of tissues.—Some tissues perform but one physiologic function, others perform several. It is therefore difficult to classify tissues in this way except by the most important of their physiological functions. The following arrangement has been suggested by several authorities:

a. Undifferentiated tissues.—Composed of cells which have developed along no special line but retain the properties of the cells forming the very young body before cell differentiation takes place. Lymph and white blood corpuscles are examples of this tissue.

b. Supporting tissues.—This type of tissue is used to support and protect more delicate tissue and to resist strain or pressure.

c. Nutritive tissues.—These form a large group and include assimilative, eliminative, and respiratory tissue.

d. Storage tissues.—These tissues are composed of storage cells of which fat cells and liver cells are examples. These cells store reserve supplies of food which they supply when needed.

e. Excitable or irritable tissues.—Tissues which are especially susceptible to changes in their surroundings and are therefore useful in giving to the body information as to what is going on around it. Any change in the environment which serves to arouse response in an excitable tissue is called a *stimulus.*

f. Conductive tissues.—Serve to bring into communication the various parts of the body. This is exhibited to a very high degree by nervous tissue.

g. Motor tissues.—The two best examples of this type of tissue are muscular tissue and the ciliated cells which line certain organs of the body. These cells have fine thread-like appendages which are kept in constant motion. These appendages are called *cilia.* The constant motion of the cilia causes material on the surface to be moved along in one direction or another.

h. Protective tissues.—As the name indicates these tissues line or protect certain parts of the body, as the enamel of the teeth, the epithelium covering the body, etc.

i. Reproductive tissues.—These tissues are concerned in the production of new individuals. The different sexes have different types which conjoin for the origination of offspring. Various types of these tissues are combined to form the different parts of the body.

19. Skeletal system.—*a.* The skeletal or bony structure of the body is made up of over 200 bones. It has a threefold function: To support the body; to afford protection to certain organs of the body which might easily be injured; and to furnish a system of levers which when acted upon by the muscles causes the body to move.

b. The skeleton may be divided for descriptive purposes into the *axial* skeleton, which includes the skull, the spine, the breastbone, and the ribs, and the *appendicular* skeleton, which is composed of the bones of the arms and the legs and the bones by means of which these appendages are attached to the axial skeleton.

c. The *skull* is made up of 22 bones, 8 of which form the cranium, and 14 the face. Of the cranial bones, the one forming the forehead is the *frontal* bone. The top of the skull is formed by the two *parietal* bones. In the back is the *occipital* bone, and at either side is the *temporal* bone, the upper part of which corresponds to the

temple, the lower part including the ear. In addition to these there are the *sphenoidal* bone, which forms a part of the floor of the cranium, and the *ethmoid*, which lies in front and forms the roof of the nasal cavity. The more important bones of the face are the *nasal* bones, which form the bridge of the nose; the two *malar*, or cheek, bones; the two upper and one lower jaw bones. These bones of the skull, with the exception of the lower jaw bone are, in the adult, immovably joined together. At the back part of the base of the skull is the large opening through which the spinal cord passes from the spinal column on its way to the brain.

d. The *spine* or vertebral column consists of 26 irregularly shaped bones, all possessing a general sameness in outline except for modifications in the several parts of the column. Each has a flattened body at the back of which appears the arch which serves to enclose and protect the spinal cord. Spinous processes project posteriorly and lateral processes from the sides of the vertebral arches, their principal purpose being to limit the movement of the intervertebral joint.

e. The *thoracic wall* consists of the *sternum*, or breastbone, 12 ribs on either side, and the vertebral column at the back. While all of the ribs articulate with the vertebral column, only the upper seven pairs are connected directly, by means of cartilage, with the sternum. These are called true ribs. The next lowermost three pairs of ribs have their cartilages attached to the rib above. The remaining two pairs have no anterior cartilaginous attachments. These five pairs of ribs are spoken of as false ribs.

f. The shoulder girdle consists of the *scapula* or shoulder blade, and the *clavicle* or collar bone. The scapula lies embedded in the muscles on the outside of the ribs and at the sides of the vertebral column and to it is articulated the arm bone. The clavicle serves to keep the scapula in place.

g. The pelvic girdle consists of the hip bone on either side and the wedge-shaped base of the spinal column, the *sacrum*, at the back. Each hip bone possesses a deep socket into which the head of the thigh bone articulates.

h. The upper and lower limbs may be considered at one and the same time, for each contains 30 bones, the arrangement of which in each is very similar. The differences in structure have resulted from changes in function resulting from adaptation of the upper limb to prehensile purposes and the lower to weight bearing and locomotion. The socket of the scapula into which the round head of the humerus fits is shallow and this fact together with the relative looseness of

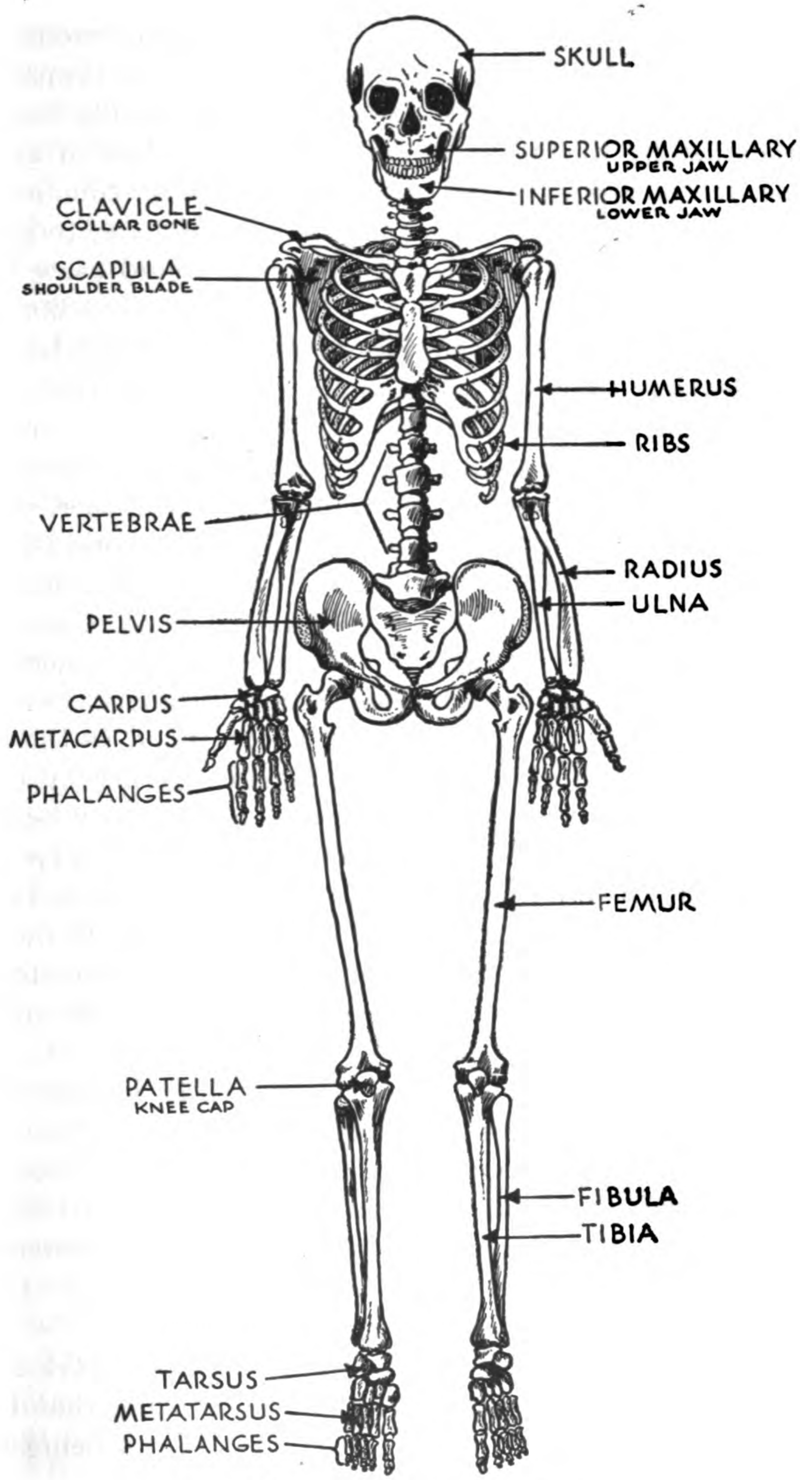


FIGURE 1.—Bony skeleton.

attachment of the shoulder girdle permits a wide range of motion at the shoulder. The articulation of the arm and forearm at the elbow permits not only flexion and extension, but also pronation and permits not only flexion and extension, but also pronation and radius over the ulna. The eight small wrist bones are loosely connected together by ligaments, allowing great freedom of movement. Then, too, the elongated digits, more especially the thumb which is opposable to any of the other fingers, permit the hand to grasp and manipulate objects readily. The lower limb would serve no good purpose were its flexibility as great as that of the upper limb. Since it must bear the weight of the body, its bones must be sturdier, therefore heavier, than the corresponding bones of the upper extremity. The hip girdle, unlike the shoulder girdle, is firmly fixed; the socket of the hip bone, into which the femur fits, is much deeper than the socket of the scapula; consequently, while there is a limitation of flexibility at the hip joint there is also considerably less of a liability to dislocation than there is at the shoulder. In the knee there is very little more than a forward motion, and because the fibula, the more slender of the two leg bones, is attached firmly to the upper end of the tibia, pronation and supination are lacking in the leg. The bones of the foot which correspond to the bones of the wrist are larger, and being closely bound together by ligaments do not possess a similar degree of freedom of motion. But because there must be elasticity to permit springiness in the step so as to avoid jarring, the bones of the foot are arranged in arch formation. The bones of the toes are much shorter than those of the fingers, consequently, they are less flexible, and because the great toe cannot be opposed to any of the other toes the foot lacks prehensile qualities.

20. Development of bone.—*a*. When a child is born the bones of the body, although formed, are not continuous masses of bony tissue. Each is partly composed of cartilage. The process of bone formation is very complicated and in these areas of cartilage starts from small points or centers of ossification. These centers finally enlarge and when adult life is reached have replaced all of the cartilaginous tissue.

b. In the large bone of the arm in a child both ends are separated from the shaft by cartilage and it is in these areas that the bone grows in length by new cartilage appearing and later being replaced by bone. The bone grows in thickness by new bony tissue being formed beneath the covering membrane or *periosteum*.

c. The bones of children are quite flexible but as old age comes on this flexibility is slowly lost and they become very brittle.

21. Joints.—Where two bones of the skeleton come into apposition they form a *joint* or *articulation*. Some joints permit of no motion while others permit motion in many directions. The principal kinds of joints are the following:

a. Fixed joints.—Best illustrated by the union between certain bones of the skull which permit no motion and are called *sutures*.

b. Ball-and-socket joints.—As the name implies, in a joint of this type the rounded end of one bone fits into a hollowed surface of the other and its characteristic is that it permits a greater degree of motion than do other joints. The shoulder and hip joints are examples. At the hip joint the thigh may be flexed, that is, moved upward and forward, or extended, that is, moved backward. It may be moved toward or away from the other thigh, and it may be made to produce a cone-like motion, the apex of the cone being at the joint, which is in reality a combination of the other possible motions.

c. Hinge joints.—A joint of this type permits of a movement in one plane as in a hinge. The knee joint is one of the best examples of this kind of joint.

d. Pivot joints.—The best example of this type is between the first and second bones of the spine. One bone rotates around another which remains stationary.

e. Gliding joints.—In the closely packed bones of the wrist, for example, little motion is permitted except that provided by one of the bones sliding a short distance over the surface of the other.

22. Muscular system.—The muscles make up the main motor organs of the body. There are three types of muscle tissue:

a. Voluntary muscles, which are under our control and may be moved at will. These make up the mass of skeletal muscles and on account of their appearance under the microscope are sometimes called *striped* muscles.

b. Involuntary muscles are not fixed to the skeleton, but largely surround cavities or tubes in the body. These muscles act without our will and from their microscopic appearance are called *smooth* muscles. The muscles surrounding the stomach are examples of this type.

c. Heart muscle is involuntary muscle but differs somewhat from other involuntary muscle tissue when examined under the microscope. In fact, it more closely resembles voluntary muscle.

23. Relationship of bones and attached muscles.—*a.* Muscles are attached by means of *tendons* to the bones of the body and by their contractions cause parts of the body to move. The point where one tendon is attached is called the *origin* of the muscle and where the other end is attached is called the *insertion.* The origin is usually in that part of the skeleton which is less freely movable than the part to which the insertion is attached. Muscles are of various sizes and shapes and may have a tendon only at one end or along one side, depending on the function of the muscle.

b. When the muscles serve to move bones they act as levers. The most common muscular movements used are levers of the third order, where the power is between the weight and the fulcrum. An example of this may be seen in bending the forearm. The fulcrum here is the elbow joint and the power is applied by muscles having their insertion in the bones of the forearm and the weight being the weight of the hand itself. Some other motions of the body illustrate levers of the first and second order; for example, the nodding movement of the head illustrates a lever of the first order and the act of standing on the toes illustrates one of the second order.

24. Activity of voluntary and involuntary muscles.—When we send a nervous impulse to a voluntary muscle, the muscle moves either rapidly or slowly, as we will it to do. On the other hand, involuntary muscle acts without any direction sent to it by our will and may contract at varying intervals like the muscles of the stomach and intestines or may stay in an almost permanent state of contraction.

25. Posture.—The posture of the body is applied to those positions of equilibrium of the body, such as standing, sitting, or lying, which can be maintained for some time. When the body is held in any one of these positions there is always a slight, sustained contracture of the muscles to prevent the joints from bending. This is called *tonus.* If the position is held for any considerable length of time a certain amount of fatigue is produced, and should the muscles not be in a healthy condition this fatigue is produced earlier than if they were healthy. The result of this fatigue causes relaxation of the muscles and improper posture. When a person not well developed stands erect for a long period the muscular relaxation or lack of tone causes him to slump.

26. Effect of exercise on muscle.—*a.* Good food, pure air, and a proper functioning of the body are necessary for the healthy working of the body. In addition to these, the muscles must be exercised. In fact, a muscle must be exercised in order to get the proper nourishment, as each muscle acts as a sort of chemical engine and the contrac-

tion and relaxation are required to throw off waste products and take in new fuel from the surrounding body fluids.

b. When a muscle is not used at all it becomes much smaller and wastes away. This is called *atrophy* of the muscle. On the other hand, when any muscle or group of muscles is used over and over again in excess of normal the muscles become larger or undergo *hypertrophy.* The calf muscles of runners are examples of this. In hypertrophy the muscle cells become larger but do not increase in number.

27. Heart and circulation.—The heart, together with the blood vessels, form what is known as the *cardio-vascular system.* This system consists of a series of closed tubes of various sizes (arteries, veins, and capillaries) through which the blood circulates, being propelled by a muscular pump, the heart. This system of vessels leads to and from all the tissues of the body.

28. Blood vessels.—The tubes or blood vessels which carry the blood away from the heart are called *arteries*, while the vessels returning the blood to the heart are called *veins.* Connecting the arteries and veins in the various tissues are minute hair-sized vessels known as *capillaries.* These have very thin walls and form dense networks throughout the body, and it is through these networks that the blood comes in close contact with the tissues of the body in order to give up food and oxygen and take away the various waste products.

29. Heart.—*a.* The heart is a large hollow, cone-shaped organ of muscular tissue about the size of a fist. It is enclosed in a tough fibrous sac, the *pericardium.* The heart is situated between the lungs near the front part of the chest where it is well protected by the bony skeleton.

b. The heart is divided vertically into two lateral halves which do not have any opening between so that we really have two hearts, a right and a left. Each side of the heart is made up of two cavities, an *auricle* and a *ventricle*, the auricles being smaller, thinner walled, and situated above the ventricles.

c. The right side of the heart is called the venous side, as it receives into its auricle the impure blood collected by the veins. From the right auricle the blood passes to the right ventricle and then to the lungs to be purified. When purified it is returned to the left auricle and from there to the left ventricle, which by its powerful contractions forces the blood out through the arteries to the various parts of the body.

d. It will be seen from *c* above that there are really two circulatory systems connected with the heart. The one going through the lungs

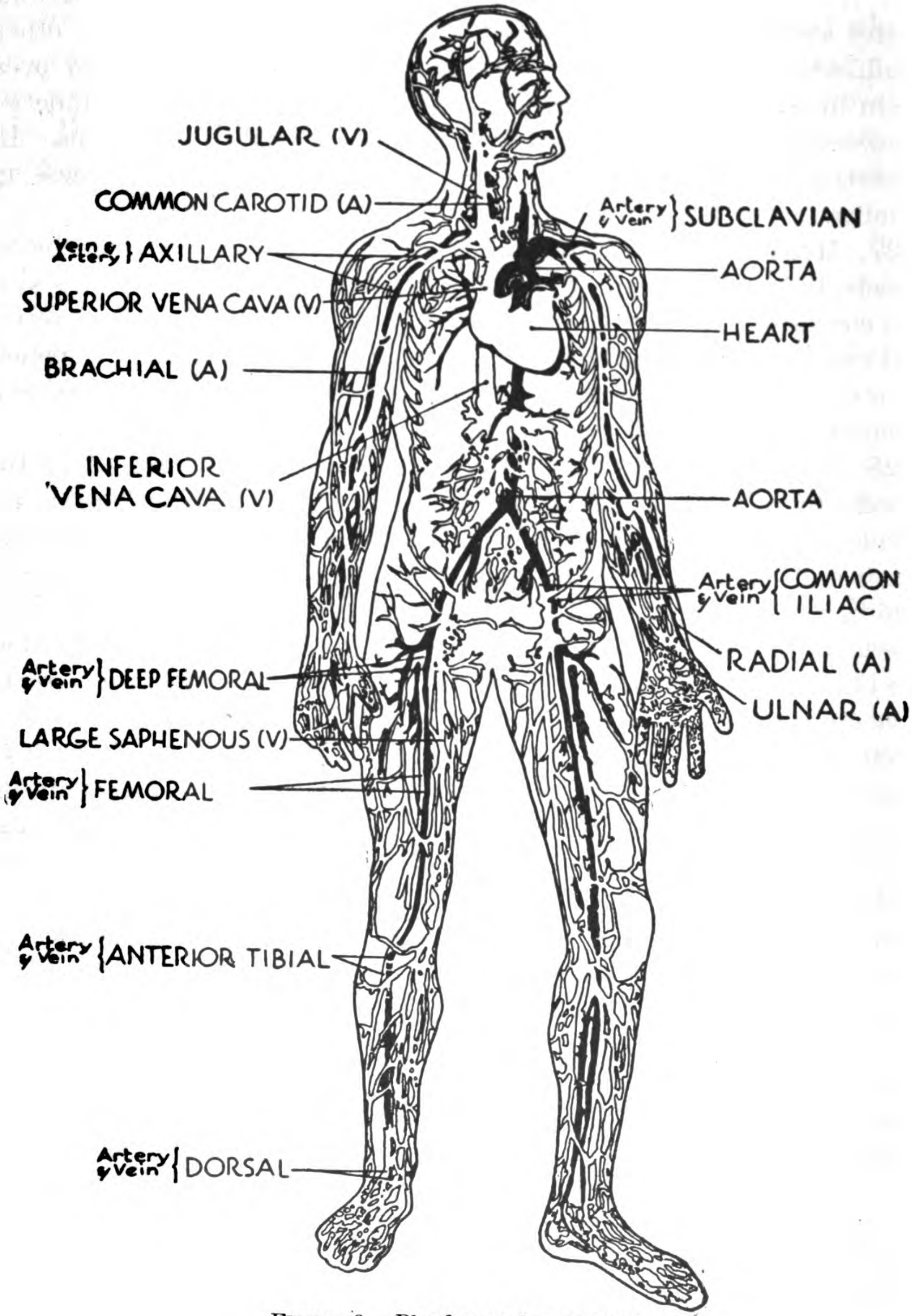


FIGURE 2.—Blood vascular system.

is called the *pulmonary* circulation and the one going through the body, the *systemic* circulation.

e. There is still a third circulatory system although this is not directly connected with the heart. This is the *portal* system. When that portion of the blood leaving the heart in the systemic circulation goes to the stomach, intestines, spleen, and pancreas, it is collected in a vein called the *portal vein*, which enters the liver and breaks up into capillaries. The blood subsequently is collected by ordinary veins for return to the heart. This portal system is very important, as it brings food material from the alimentary tract to the liver to be acted upon by that organ and either placed in circulation or stored for future use.

30. Blood.—*a.* The total quantity of blood is usually estimated at one-twelfth of the weight of the body, approximately a gallon and a half for an average adult.

b. The color of the blood, due to variation in its oxygen content, is bright red in the arteries and dark red in the veins. It is composed of cells or corpuscles floating in a liquid called the *plasma*.

c. The plasma is composed of *fibrin* and a true liquid element called *serum*. The fibrin is the active agent in causing the blood to clot or coagulate when bleeding occurs. The serum, which is plasma less fibrin, contains the food elements of the blood. There are three types of cells or corpuscles:

(1) The red cells or *erythrocytes* are round, flattened discs, slightly concave on each side and composed largely of *hemoglobin*. This substance contains iron and has the capacity of carrying large amounts of oxygen. The number of red corpuscles is 5,000,000 per cubic millimeter in the male and 4,500,000 in the female.

(2) The white cells or *leucocytes* are spherical in shape and slightly larger than the red cells. They number between 5,000 and 7,000 per cubic millimeter. They are capable of changing their form and passing through the unbroken walls of the blood vessels. These cells are capable of destroying disease-producing organisms. In the presence of most infections the number of these cells greatly increases. They form the first line of defense against infection.

(3) The blood *platelets* are very small and almost colorless cells. The average number may be given as 300,000 per cubic millimeter. It is believed that their function is to aid clotting of the blood and to maintain immunity against certain diseases. In addition to the cells described above there are several other cells occurring in small numbers of which very little is known.

31. Lymphatic system.—*a.* The lymphatic system is much like the blood circulatory system except that the fluid is clear and there is a heart to propel the blood.

b. The lymph is a clear fluid of essentially the same composition as blood plasma. This lymph circulates between the cells of the body and the capillaries of the blood vascular system.

c. The lymph vessels begin in the small spaces between the individual cells, unite to form larger channels, and finally empty into the venous blood system by way of a large lymph vessel called the *thoracic duct.*

d. The lymph nodes are lenticular-shaped bodies occurring along the course of the larger lymph vessels. Where these nodes are present the lymph passes through the substance of the node and is filtered and purified. In case of infection these nodes usually become inflamed. They are of great aid in localizing and overcoming infections.

32. Respiratory system.—The term *respiration,* as commonly used, means the function of gaseous interchange between the blood and air taken into the lungs. This is really only a part of respiration and is *external respiration* as there is an exchange going on all the time between the tissues of the body and the minute blood vessels, which is called *internal respiration.*

33. Air passages.—Air reaches the lungs through the *nose, pharynx, larynx,* and *trachea.*

34. Nose.—Air enters from outside the body through the nose under ordinary conditions, although it may be taken in through the mouth. The nose is divided inside into two *nasal* passages by a *septum* and nature has so shaped the nasal passages that the cooler outside air is slightly warmed and certain foreign material, such as dust particles, may be removed prior to the air reaching the lungs. Leading from the nasal passages are irregularly shaped recesses called the *sinuses.* The inner surfaces of the sinuses are lined by a moist membrane similar to that found in the nose. Inflammation of these recesses is called *sinusitis* and may arise from an extension of an ordinary cold in the nose.

35. Pharynx.—*a.* The pharynx is the large opening back of the cavity of the mouth. It is a common passageway for both food and air as it also communicates with the nasal passages. The pharynx continues downward as the larynx in front and a tube for food, the *esophagus,* in the rear.

b. At the root of the tongue there is a small triangular-shaped flap covering the opening into the larynx; when food is swallowed this

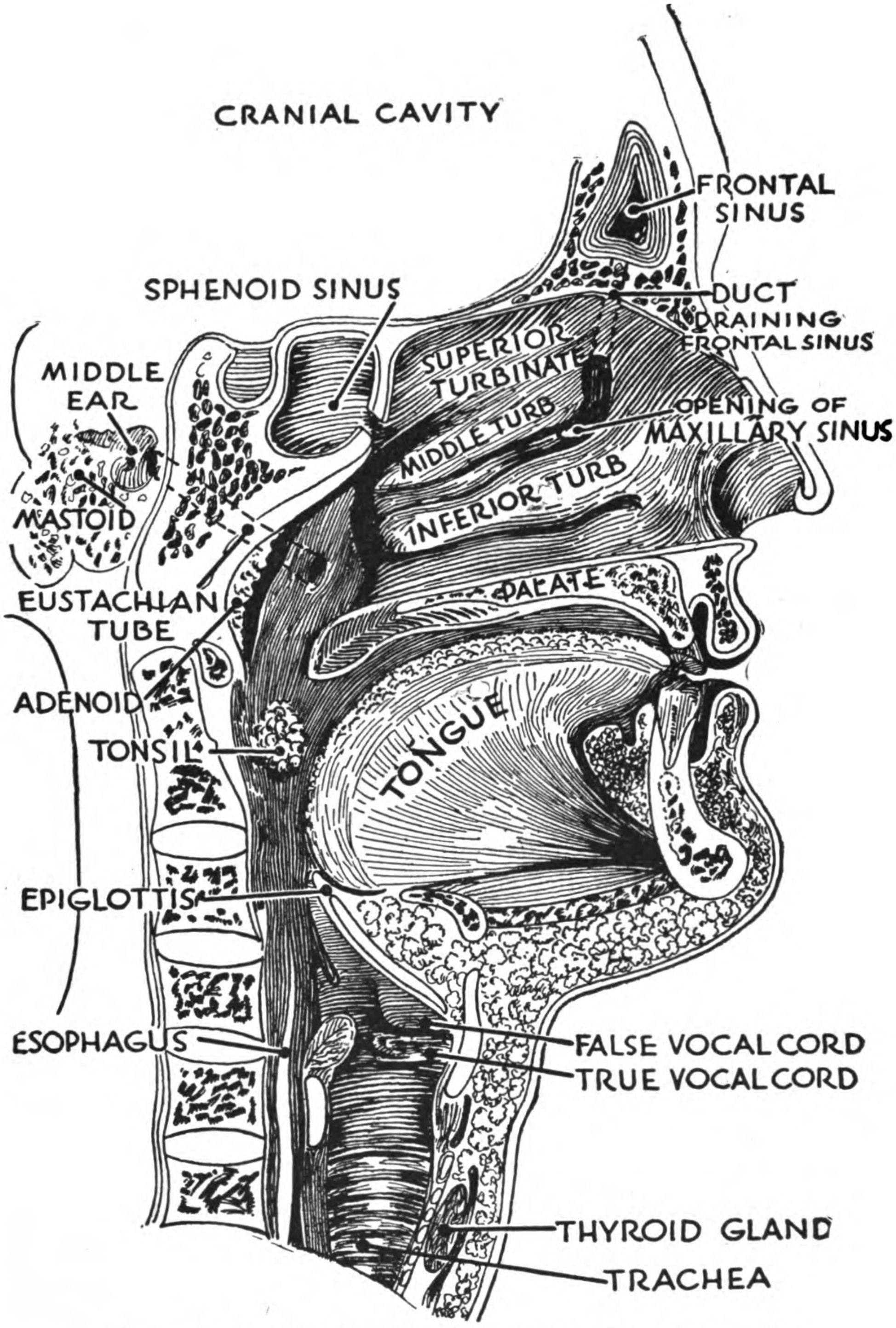


Figure 3.—Longitudinal section through nose, throat, and mouth.

flap closes and prevents food from entering the larynx. This flap is called the *epiglottis*.

36. Larynx.—The larynx or "voice box" is that portion of the respiratory tract connecting the pharynx and the trachea. It is composed of nine cartilages and muscular and connective tissues. This organ contains two bands of tissue called the *vocal cords*. When the vocal cords are placed in a certain position and air is driven past them they are set in vibration and emit a certain sound. The strength of the blast of air determines the loudness of the sound, the size of the larynx itself determining the pitch. In women and children the larynx is smaller than in men and the pitch is higher. The sounds made by the vocal cords are strengthened by the resonance of the air in the pharynx and mouth and are altered by the movements of the tongue, cheeks, throat, and lips into speech.

37. Trachea.—The trachea, or windpipe, is a tube extending from the lower part of the larynx to the lungs. It is about 4 inches long and at its lower end divides into two parts, the *bronchi*, one of which goes to each lung. The trachea is composed of irregular rings of cartilage connected by supporting tissue.

38. Lungs.—*a*. The lungs are two in number, a right and left. Each has a bronchus connecting it with the trachea. These bronchi continue into the lung dividing and redividing until they end in a minute dilation or sac. As the bronchial tubes divide and redivide they become smaller and their walls become thinner until the smallest one as well as the terminal sacs or *alveoli* consist of but a single layer of cells. This single layer of cells is all that separates the inspired air from the very thin-walled capillaries surrounding them so that the diffusion of gases may take place readily.

b. The lungs are covered by a thin membrane, the *pleura*, and are not connected with any other tissue except at the *hilum* or root. The arteries, veins, and bronchi enter at the roots of the lungs.

39. Chest cavity.—The chest cavity or thorax is a cone-shaped cavity with the narrow end upward. It is surrounded on the outside by the ribs, breastbone, and spinal column, the bottom being closed by the *diaphragm*. In addition to the lungs the thorax contains the heart, trachea, and esophagus. The chest cavity is lined by the same kind of membrane that covers each lung, the *pleura*. In fact, the membrane covering the lung folds back on itself to line the chest wall so that between the lung and the chest wall it forms a sac called the *pleural cavity*.

40. Mechanism of respiration.—*a*. The respiratory movements are to a certain extent under the control of the will in that we can

breathe rapidly or slowly or take either deep or shallow breaths. But this is limited in extent, as our ordinary breathing goes on involuntarily. This ordinary type of breathing is controlled by certain centers in the brain which are excited by the type of blood flowing through them. That is, when venous blood flows through them the respirations are increased and the greater the demand of purification of the blood the greater the stimulation.

b. When a breath is taken in, the chest increases in size in all diameters. The diaphram, which at rest is dome-shaped, contracts and flattens the dome, which in turn increases the vertical diameter of the chest. By movement of the ribs on their articulations with the vertebrae the diameters from front to back and side to side are also increased. Inspiration, or the taking in of a breath, requires considerable muscular action. Expiration, on the other hand, requires very little, as the chest simply returns to a resting position.

c. The lungs contain a certain amount of air at all times, even after a forced expiration. The lung capacities of different individuals vary greatly but in an average size man, even after forced expiration, the lungs contain about 1,000 cubic centimeters of air, called the *residual* air. Under ordinary circumstances we do not make forced expirations so that in addition to this amount there are between 1,500 and 2,000 cubic centimeters left, known as the *supplemental* air. These two make up the *stationary* air. The air ordinarily taken in is known as the *tidal* air and in addition that taken in on forced inspiration is known as the *complemental* air.

41. Digestive system.—The digestive system is made up of the alimentary canal and various organs or glands attached to it. The function of this system is to prepare food so that it can be used by the various parts of the body.

42. Foods.—In order to provide energy for the body and to maintain and repair the tissues it is necessary to furnish material which can be made available for this purpose. Foodstuffs are usually classified as being *carbohydrate*, *fat*, or *protein*. In addition to these the body requires water, certain inorganic salts, and certain food constituents which are known as *vitamins*.

43. Proteins.—Proteins are required to replace worn-out tissue. They also furnish much of the fuel supply of the body. Meat, eggs, cheese, and beans are all rich in proteins.

44. Carbohydrates.—Carbohydrates are oxidized in the body to give it energy to carry on its work. They are mostly of vegetable origin. Flour, sugar, and rice are examples of food rich in carbohydrates.

45. Fats.—Fats may be of animal origin, as in butter, or may occur in vegetables, as in olives. They act very much like the carbohydrates in furnishing energy to the body machine.

46. Composition of foods.—Most foods contain more than one nutriment. Milk, for instance, contains two proteins, several fats, and a carbohydrate. In addition there are several salts and vitamins.

47. Enzymes.—Food to be used by the body must be reduced from a complex substance to more simple compounds. This reduction is carried on by means of substances called *enzymes*. There are enzymes for the various types of food; they split carbohydrates into simple sugars, fats into fatty acid, and glycerine and proteins into acids. These enzymes are present in the various secretions of the alimentary canal, each secretion having its specific enzyme. Some of the secretions contain more than one enzyme.

48. Absorption.—*a*. After the food has been acted upon by the digestive juices it must be taken to the various tissues of the body in order to supply them with nutritive material. The transfer of food from the alimentary canal to the circulatory system is called *absorption*. This takes place almost entirely in the small intestine.

b. The simple food compounds are taken up by the receptive cells of the small intestine and pass either directly into the blood stream, or into lymph vessels which later discharge them directly into the blood stream. As the blood itself comes in contact with very few tissue cells there has to be some way of getting food to these cells. This is done by a process called *diffusion* which goes on between the blood in the capillaries and lymph outside. This same interchange goes on between the tissue cells and the lymph. The interchange of fluid is governed by *osmotic pressure*.

49. Metabolism.—Metabolism is that process by means of which foods are broken down and rebuilt into living tissue.

a. The *mouth* is the first organ taking part in the preparation of food for absorption. The food after it is taken into the mouth is broken apart by the teeth in the act of chewing and is mixed with a substance called *saliva*. This is secreted by a group of glands located inside of the cheeks, under the tongue, and under the lower jaw. Saliva contains an enzyme (*ptyalin*) which acts on starches to reduce them to maltose. After the food becomes semi-liquid it is swallowed and passes down the *esophagus* or gullet to the stomach.

b. The *stomach* is a muscular, sac-like organ which lies just below the diaphragm and is lined with cells which secrete the *gastric juice*. This juice is an acid liquid which contains pepsin, an enzyme acting on the proteins to break them up into simpler compounds. At either

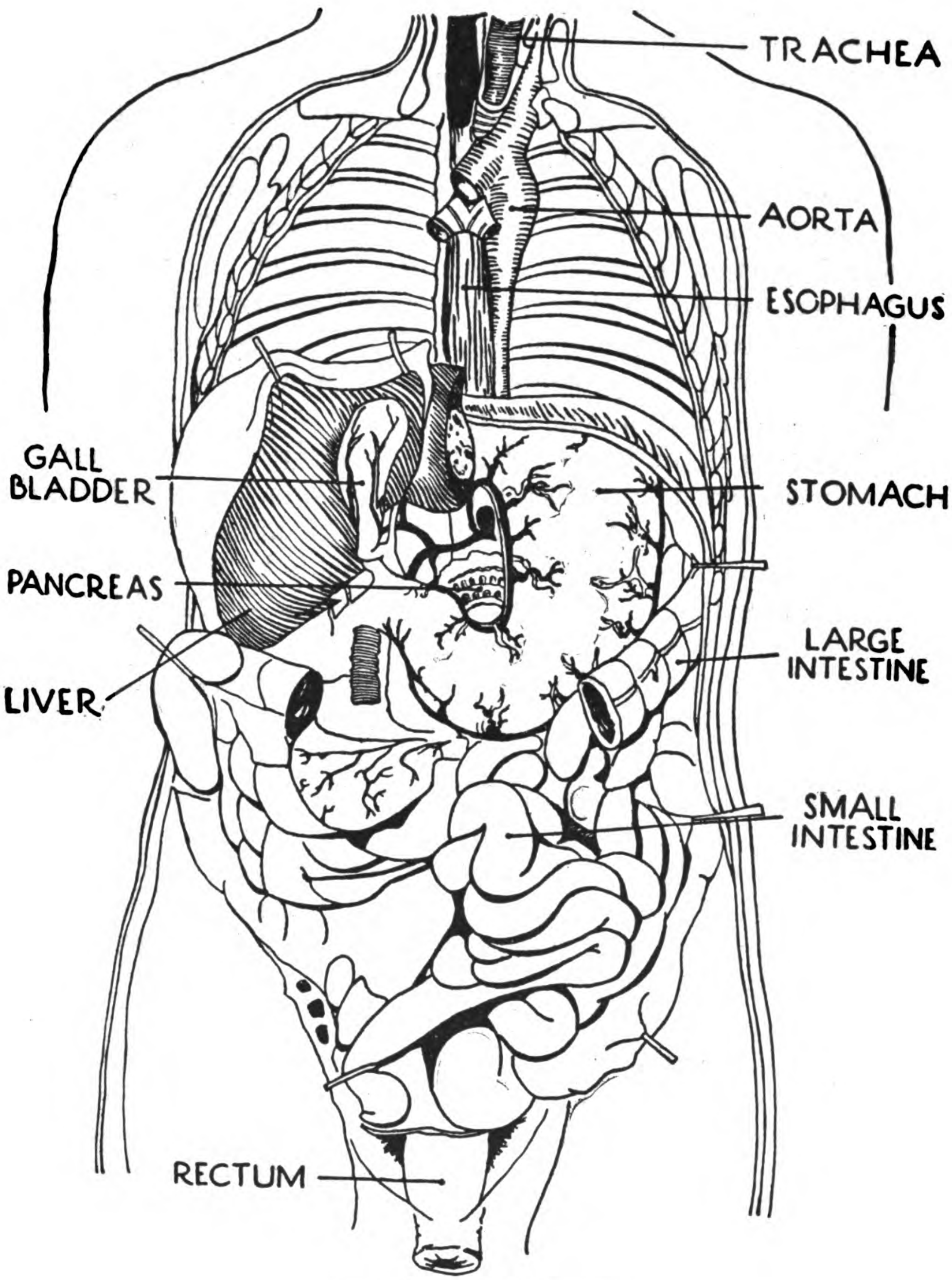


FIGURE 4.—Digestive system.

end of the stomach there are rings of muscular tissue which, when contracted, close the openings and keep the food in the organ until gastric digestion has been completed. When this has occurred the muscle fibers in the wall of the stomach contract and force the food into the small intestine.

c. The *small intestine* is a long tube (about 22 feet) which lies coiled up in the abdominal cavity. It is in this organ that digestion is completed and from which the food is absorbed.

(1) There is a small opening in the small intestine which receives juice from the *pancreas* and bile from the *liver*. These two organs are very important accessory glands of digestion.

(*a*) The pancreas, which secretes *pancreatic juice*, is a long, narrow gland located back of the stomach. This juice carries on the work of breaking down the proteins and starches already started in the stomach and in addition acts on the fats.

(*b*) The liver is the largest gland in the body and lies on the right side of the abdomen just beneath the diaphragm. *Bile* is formed by the liver cells and is collected in ducts which unite to form the one opening into the intestine. Some of the bile is by-passed up a small duct to a sac called the gall bladder. Here it is stored for future use. Bile does not contain any specific enzyme used in digestion, but it does aid the action of the pancreatic juice, especially in its action on fats.

(2) Certain cells of the small intestine secrete the last digestive juice to come into contact with the food. This *intestinal juice* completes the breaking down of the proteins and starches.

d. The *large intestine* or colon is between 3 and 4 feet long and is much larger in diameter than the small intestine. It starts in the right lower part of the abdomen where the small intestine empties into it, extends upward to the under-surface of the liver, then across the upper abdomen, and down the left side to end in the anus. Most of the nutritive matter from the food has been absorbed in the small intestine, but the contents discharged into the colon are very liquid and as these are churned around whatever remains of value is absorbed together with much of the water content. The material remaining consists of undigested substances, bacteria, and some waste products which collect in the lower part of the colon and are passed as fecal material.

50. Excretory system.—Waste material of the body is gotton rid of through the skin, lungs, and urinary system, as well as the large intestine. The liver also acts as an excretory organ as it separates waste material from the blood and also changes certain harmful

excretory substances into harmless ones and returns them to the blood for excretion through the skin and in the urine.

51. Skin.—The skin, in addition to being a protective covering, acts as an excretory organ. Skin consists of two layers, the *cuticle* or *epidermis* and the *true skin*. Located in the true skin are many very small glands, the sweat glands. These glands secrete the sweat, which varies greatly in amount, depending upon the environmental temperature, activity of the individual, and certain other conditions. Sweat contains a certain amount of waste products similar to some contained in the *urine*.

52. Urinary system.—The urinary system consists of the kidneys, ureters, bladder, and urethra.

a. The *kidneys* are two in number each one lying on the side of the spinal column in the back of the abdomen. They are bean-shaped organs between 4 and 5 inches in length and on the concave side of each is a notch called the *hilum*. Here the large blood vessels enter and leave the organ and the tube (ureter) which takes away the urine has its origin. The blood enters the kidneys and when it has reached the fine capillaries the cells of the gland remove the impurities which pass into the ureters as urine.

b. The *ureters* are small tubes which carry the urine from the kidneys to the bladder. There is one ureter for each kidney.

c. The *bladder* is a hollow, muscular organ lying low in the body just behind the pelvic bone. A ureter enters each side of the organ and as the kidneys secrete the urine it passes on to the bladder, where it is stored, having to be emptied only at intervals.

d. The *urethra* is the tube through which the urine is discharged from the bladder.

53. Nervous system.—The nervous system is the most complex system of the body and may be thought of as two systems, as the functions of one differ from the other. The *cerebro-spinal system* is that part made up of the brain and spinal cord and the nerves given off by these organs, namely, 43 cranial and spinal nerves. The other system is called the *sympathetic nervous system* and consists of two rows of central ganglia (masses of nerve cells) lying along the front of the spinal column, the ganglia being united with each other by strands of nerve fibers and connected by means of sympathetic nerves with various parts of the body. The sympathetic system has largely to do with the movement of involuntary muscles and the activities of glands.

a. *Brain*.—The brain lies well protected in the skull. The organ consists of a large *cerebrum* and a much smaller *cerebellum*. The

cerebrum is the seat of the mind. When it is removed all pow of moving voluntary muscles is gone. Without it all sensations light, taste, smell, touch, and heat are lost. The cerebrum decid what we shall do. It sends out the messages to the muscles wh

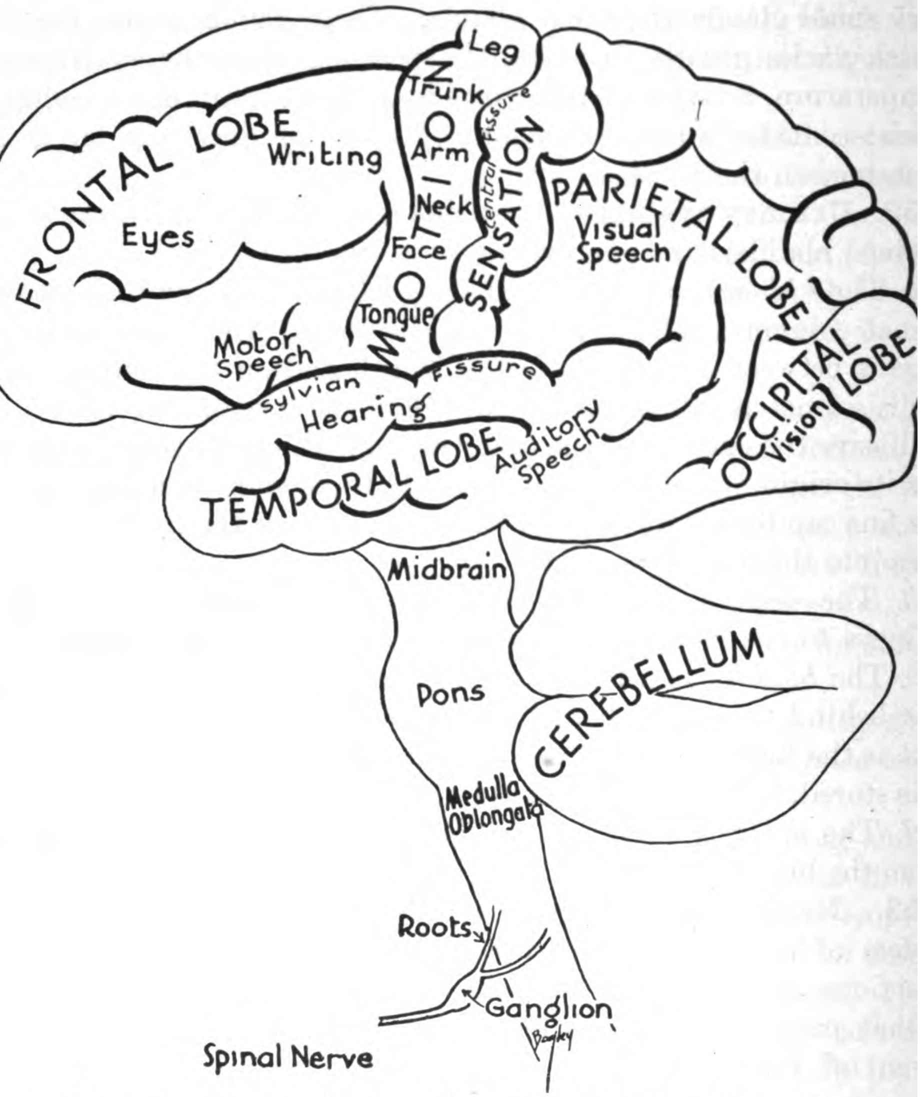


FIGURE 5.—Diagrammatic illustration of lateral aspect of the brain.

we wish to move and is that part of the brain that thinks and fee Without a cerebrum an animal can live but all of its intelligence gone. It still breathes but is only a machine.

b. Cerebellum.—The cerebellum causes all the muscles to ke the proper amount of contraction (*tonus*) and it assists in governi the muscles in standing and walking.

c. Spinal cord.—The spinal cord is a continuation of the nerv tissue extending from the brain down through the spinal can

The spinal cord widens out on its upper end where it is attached to the brain to form the *medulla oblongata.* The medulla is a very important part of the brain as it contains the nerve centers governing the action of the heart and respiration. The spinal cord itself is a large bundle of nerve fibers which carry nervous impulses from the various parts of the body to the brain as well as impulses in the opposite direction.

54. **Glands and their products.**—The fact that certain groups of tissue cells supply certain secretions to the body has been pointed out under the description of the alimentary tract. Some of these same glands also secrete substances which are absorbed directly into the blood stream. The pancreas, for example, not only secretes pancreatic juice but it secretes a substance directly into the blood which has to do with carbohydrate metabolism.

a. The *endocrine* glands is a term applied to these glands and the active substances contained in their secretions are called *hormones.* These hormones influence such functions as growth, reproduction, and metabolism.

b. The *thyroid* gland, in the neck, one of the largest glands whose secretion is entirely an internal one, was one of the first to be studied from this view. Overactivity of this gland causes nervousness, loss of weight, rapid heart, and other symptoms, while an insufficient amount of secretion, in children, causes mental dullness, retardation of growth of the long bones, coarse hair, etc.

c. The following glands secrete one or more hormones: Adrenals, ovaries, glands in the lining of the stomach and duodenum, testicles, pancreas, thyroid, parathyroid, and pituitary. It is also believed that certain other glands secrete hormones but it has never been definitely proved.

55. **Special senses.**—The special senses are feeling, tasting, smelling, hearing, and seeing. These senses are due to the peculiar development of the ends of sensory nerves in various parts of the body. The sense of feeling is more or less generally distributed over the body surface. However, in some places as the finger tips, the nerve endings are very close together and feeling is more acute. The sensory nerves of taste are all located in the mouth and those of smell in the nose. The other two special senses have rather complicated end organs which aid in the reception of either light or sound waves.

56. **Eye.**—The eye may be likened to a small camera which is constantly photographing objects and sending the picture to the brain.

a. The eyes are well protected from injury by being placed in a hollow or socket in the front of the skull. On the exposed side they

are protected by the eyelids, eyebrows, and eyelashes. The exposed surface of the eye and the inner surface of the lid are kept moist by the secretion of the tear glands.

b. The eyeball is generally spherical in shape being made up of two hollow segments of unequal size. The larger, posterior segment comprises about five-sixths of the eyeball and the anterior, one-sixth. These segments form two chambers, the larger containing a gelatinous material, the vitreous humor, and the smaller, the aqueous humor.

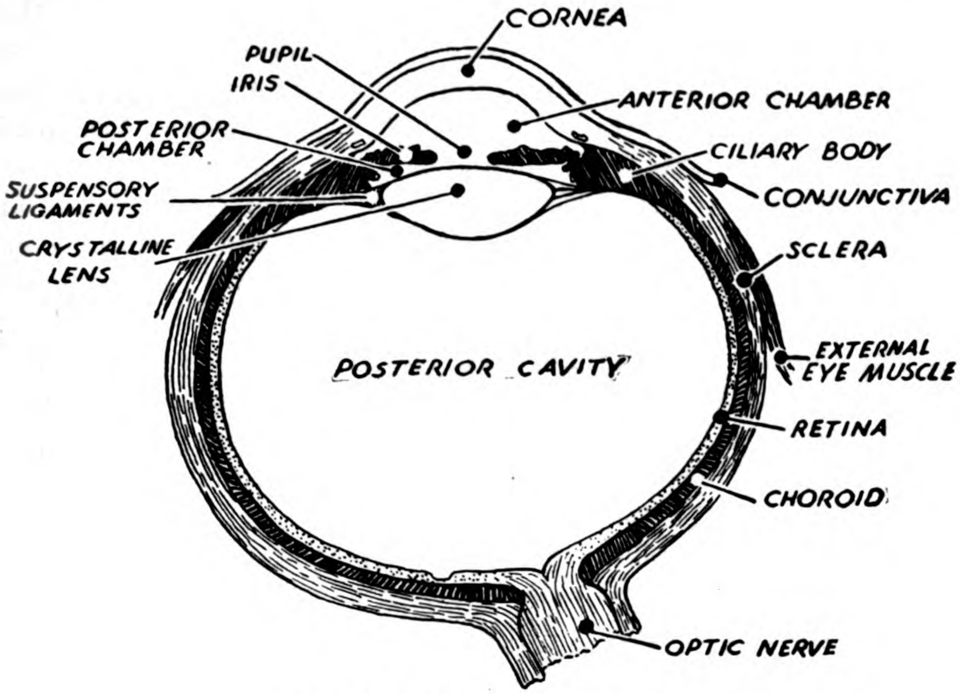


FIGURE 6.—Cross section of eye.

c. The eye has three coats, a thick outer protective one which is continuous with the clear *cornea* in front, but otherwise is thick and white; a middle coat which contains blood vessels, a small muscle, and in front the *iris;* and an inner coat which contains the end organs of sight of the optic nerve. This inner coat is called the *retina.*

d. The *lens* is placed right behind the pupil, being held in place by the *ciliary* muscle.

e. If the eye is compared with a camera it will be seen that rays of light, entering the front of the eye through the pupil, pass through the lens and are registered on the retina, which corresponds to the film. Now in taking pictures with a camera the operator has to regulate his light by means of a stop or diaphragm. This is done in the

eye by the iris which produces a small aperture in bright light and a larger one in dull light. In a camera the lens is moved away from or toward the film in order that the light rays from the object to be photographed will fall on the film. This focus is changed depending upon the distance of the object from the camera. In the eye the focus is not changed by shortening or lengthening the box, but by contraction and relaxation of the ciliary muscle the lens is made thicker or thinner as required.

57. Vision.—*a.* The first phase in vision, insofar as the eye is concerned, is the formation on the retina of an image of a luminous object. The image is formed by the refractive actions of the cornea, aqueous humor, crystalline lens, and vitreous body. These structures are colorless and transparent. Their refractive indices are greater than that of air. The cornea and aqueous humor form a concavo-convex lens. The crystalline lens is bi-convex, the curvatures of its surfaces different and changeable. The amount of light admitted to the eye is controlled by the action of the lids and of the iris. The eyes are directed toward an object being viewed by movement of the head and of the eyeballs themselves. The extrinsic muscles of the eye act to keep the principal axes of the two eyes parallel, convergent, or divergent as required. The combined effect of the refractive structures of the eye may be considered as that of a bi-convex lens, the posterior focal plane of which lies in the retina. Images of external objects are formed on the retina stimulating the sensory cells thereof. The sensation is conveyed to the visual tracts of the brain where perception takes place. Although the image formed on the retina is inverted this gives rise to no confusion as we have learned by experience to make proper interpretation of the sensation.

b. The production of a clear, distinct image on the retina is dependent, in the normal eye, upon the distance of the object from the optical center of the refractive system. When this distance is greater than 20 feet all light rays from each of the innumerable luminous points of the object are practically parallel and will be focused properly. As the distance decreases the rays will be divergent hence will not be focused. This difficulty is overcome by a change in the focal distance of the refractive system, a change which is produced by alteration of the curvature of the surfaces of the crystalline lens. This power of accommodation, as it is designated, is greatest in early life and decreases steadily with age. At 10 years of age the normal eye can form a distinct image of an object 2¾ inches from the eye; by the fortieth year this distance has increased to about 8¾ inches and by the fiftieth year to 15¾

inches. Between the fortieth and fiftieth years, therefore, most people find it necessary to use convex lenses for near vision.

c. In the normal eye the optical center of the refractive system is 15.5 millimeters from the retina. In many individuals the distance is either greater or less than this. When such is the case a distinct image is not formed on the retina. In the myopic (short sighted) eye the antero-posterior diameter of the eyeball is greater than normal, or the curvature of the cornea, or lens, too great. Lengthening of the eyeball is the more common case. Rays of light are focused before reaching the retina and the retinal image is indistinct as a consequence. Myopia may be congenital or acquired; usually it is acquired. The defect may be produced by the increase in tension within the eyeball which results when the eyes are much converged, as for example, in reading with the book too near the eyes, a thing which is often done when the illumination is poor. If the fibrous coat of the eyeball be weak the increased tension tends to produce elongation of the antero-posterior diameter.

d. In the hypermetropic (far sighted) eye the focal point of the refractive system is beyond the retina and the retinal image is diffuse. The condition may be due to lessened curvature of the cornea or lens but is generally the result of a diminished antero-posterior diameter of the eye-ball. In most instances the defect is congenital.

e. Astigmatism is a common optical defect. In the so-called normal eye the refractive surfaces are sections of true spheres; all the meridians of the cornea are of equal curvature, the same being true of the anterior and posterior surfaces of the crystalline lens. In this event refraction is equal at all meridians. But if there is variation in the meridional curvature of any of the surfaces it can be seen refraction will be unequal, producing inequalities of the focal lengths in different planes. This is the case in astigmatism.

58. Ear.—The ear consists of an external, a middle, and an inner ear.

a. External ear.—The external ear is ovoid in shape, flattened, wider above than below, and presents several depressions and eminences. This organ collects the sound waves and directs them through the external auditory canal to the middle ear. The external auditory canal is a tube about an inch long, slightly curved and lined with skin containing a few hairs. In the skin of the canal are a few glands which secrete a waxy substance which, together with the hairs, serves to prevent the entrance of foreign particles. The canal ends with the *eardrum* which separates it from the middle ear.

b. Middle ear.—The middle ear is a small, irregular bony cavity in the temporal bone. The eardrum separates it from the external ear. A thin bony wall in which are located two small openings separates it from the inner ear. Stretched across the cavity of the middle ear from the eardrum to one of the small openings to the inner ear are three small movable bones called the *malleus* or hammer, the *incus* or anvil, and the *stapes* or stirrup. The Eustachian or auditory tube connects the cavity of the middle ear with the throat. Generally this tube is closed by the tissues of the throat. On swallowing it is opened, allowing air to enter the ear, thereby maintaining an equality of air pressure between the inside and outside of the ear.

c. Internal ear.—The internal ear consists of two complicated structures, the spiral-shaped organ of hearing called the cochlea and the semicircular canals.

59. Mechanism of hearing.—In hearing, the sound waves are collected by the external ear and passed through the ear canal to the eardrum. These impulses are transmitted across the middle ear by the three small bones to the inner ear. Impulses received by the inner ear set in motion a fluid material filling the hearing organ proper, the cochlea. The sensory nerve cells for hearing are located in the cochlea. These cells are stimulated by the vibration of the fluid, thus giving rise to sensations which are conducted to the brain by the auditory nerve. The semicircular canals are concerned with the sense of equilibrium.

60. Male genital system.—*a.* The *testicle* is the reproductive organ of the male; however, the vas deferens, seminal vesicles, prostate gland, and penis are considered as accessory organs of reproduction.

b. The testicles are two ovoid glands which lie in a pouch of skin called the *scrotum.* They are covered with a thin membrane which doubles back on itself to line the scrotum. Before birth the testicles develop in the abdominal cavity and descend into the scrotum, usually, just before birth. The passageway closes up in most cases but sometimes remains open or at least weak so that the intestine may descend along it causing a *hernia* or *rupture.*

c. The testicles have two important functions, the first being the formation of the male cells or *spermatozoa* and the secretion of a substance necessary for the development of sexual characteristics in the male.

d. When the spermatozoa are formed they pass into a long convoluted tubule on the back of the testicle called the *epididymis.* This

tube measures about 20 feet in length but is coiled up so that it takes up but little space. The tube of the epididymis is continued in a more or less direct manner as the *vas deferens* to a membranous pouch (one on each side) lying between the base of the bladder and the rectum.

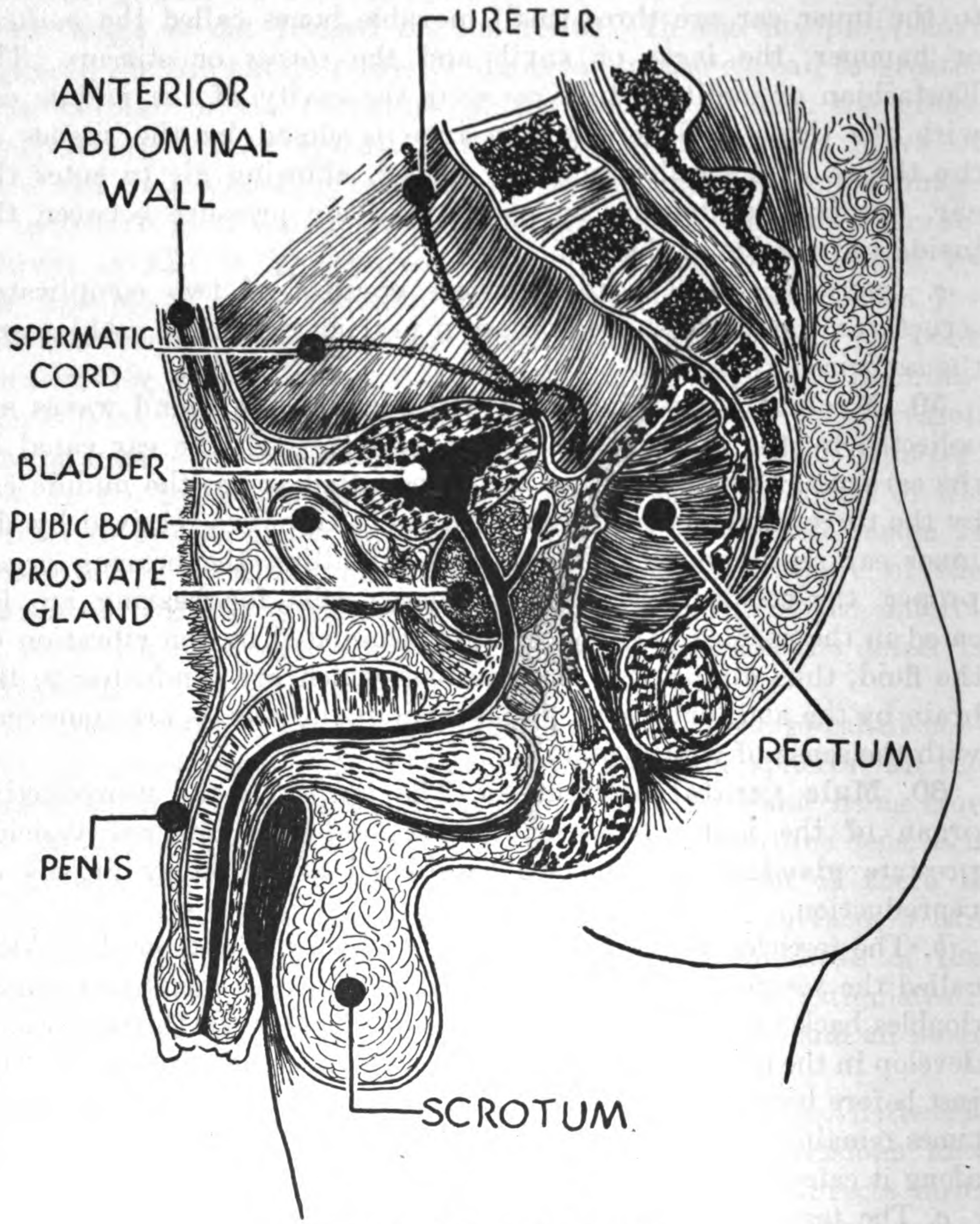


FIGURE 7.—Male genital system.

These are called the *seminal vesicles.* The seminal vesicles act as a reservoir for the spermatozoa and discharge them through small ducts into the back part of the *urethra.* At the same place where these ducts empty the *prostate gland* empties a secretion which is added to the

spermatozoa. The prostate gland is shaped somewhat like a chestnut and surrounds the urethra just as it leaves the bladder.

Section II

DENTAL

61. Mouth.—*a.* The mouth may be defined as the cavity at the beginning of the digestive tract. With its contents, it is the organ of chewing, taste, and speech. The mouth cavity is lined by mucous membrane containing many mucous glands which pour their contents, saliva, into the mouth. It is divided into two portions—the *vestibule*, a narrow, slit-like space which lies between the lips and cheeks anteriorly and laterally, and the dental arch posteriorly and medially, and the *mouth cavity proper*, the space within the dental arches. The mouth cavity proper is open posteriorly and communicates with the pharnyx by a constricted aperture, called the *isthmus facium*. Its roof is formed by the hard and soft palates, while its floor is the mylohyoid and geniohyoid muscles covered by mucous membrane on which rests the tongue. The side walls and front are formed by the alveolar processes and the teeth of the upper and lower jaws.

b. Opening into the mouth cavity are the ducts of the three paired salivary glands discharging their secretion, the *saliva*. *Stenson's duct*, from the *parotid* gland, opens into the vestibule opposite the upper second molar tooth. *Wharton's duct*, from the *submaxillary* gland, and the *ducts of Rivinus*, from the *sublingual* gland, open into the floor of the mouth anteriorly in the sublingual space beneath the tip of the tongue.

c. The tongue is a highly muscular organ, covered by mucous membrane, resting on the floor of the mouth cavity proper, and to which it is attached on its under surface by a fold of this membrane called the *frenum*. On the surface of the tongue are seen several varieties of papillae, which give to the tongue its characteristic rough appearance. The tongue contains the special organs of taste, is an important organ of speech, and aids in the process of chewing and swallowing food.

62. Teeth.—*a.* The teeth of man make their appearance in two sets or series. The first, having only temporary usage (the last of them disappearing about the twelfth year), is known as the deciduous, temporary, or milk teeth; the second set, having to serve for the

remaining life period, is known as the permanent teeth. The deciduous teeth number 20 in all, and the permanent teeth number 32 when complete. Both sets of teeth are similarly arranged, in the form of two arches, half of their number (10 for the deciduous, and 16 for the permanent) being arranged in an upper arch and the other half in an opposite lower arch.

b. The bones within which the teeth are set are known respectively as the superior maxilla, for the upper jawbone, and the inferior maxilla or mandible for the lower jawbone. An imaginary, vertical, central line dividing the body into right and left, known as the median line, divides the teeth into the same number and kind on both right and left sides. The permanent teeth are named as follows, starting from the median line:

Tooth	Name	Tooth	Name
1st	Central incisor.	5th	Second bicuspid.
2d	Lateral incisor.	6th	First molar.
3d	Cuspid.	7th	Second molar.
4th	First bicuspid.	8th	Third molar.

c. In the Army, for the purpose of convenience, uniformity, and briefness of records, the teeth are numbered from 1 to 16, right and left, beginning with the upper central incisors. Thus, the upper left central incisor would be designated as L1, the upper left third molar as L8, the lower left central incisor as L9, the lower left third molar as L16, and similarly for the right side. See figure 8.

d. Grouped collectively, the incisors and cuspids are referred to as the anterior teeth, and the bicuspids and molars as the posterior teeth. Certain other terms used in describing the teeth with which one should become familiar are—

(1) *Labial surface*.—That surface of the incisors and cuspids which lies next to the lips.

(2) *Buccal surface*.—That surface of the bicuspids and molars presenting toward the cheeks.

(3) *Facial surface*.—A term used to designate the side of a tooth next to the lips or cheeks and may be applied to either an anterior or a posterior tooth.

(4) *Lingual surface*.—That surface of a tooth toward the tongue.

(5) *Proximal surface*.—That surface which adjoins the next tooth.

(6) *Mesial surface.*—That proximal surface nearest the median line of the arch, that is, a line drawn between the central incisors.

(7) *Distal surface.*—That proximal surface that is farthest away from the median line.

(8) *Occlusal surface.*—That surface of a bicuspid or molar tooth that makes contact with a tooth of the opposite jaw when the mouth is closed.

(9) *Incisal surface.*—The cutting edge of the incisors and cuspids.

e. A tooth is divided into two main parts, the crown and root. The crown is that portion which projects above the gum and is the chewing part of a tooth. The remaining part, or root, is firmly embedded within the bony structure of the jawbone, and so designed as to withstand the stresses of chewing. (See figs. 9 and 10.) The end of the root is called the *apex* and through the opening in it the nerve and blood supply enter the tooth. The incisors, cuspids, and bicuspids (with the exception of the upper first bicuspid which may have two roots) have only one root, while the molar teeth have from two to three roots. At the junction of the crown and root of the tooth is found a constriction in greater or less degree, which is known as the *neck* or *cervix.* Occupying the central portion of the crown and root is the *pulp cavity*, containing the dental pulp. This cavity is divided into two parts—that in the crown, known as the *pulp chamber*, and that in the root, known as the *pulp canal.*

f. The *alveolar process* is that portion of the maxilla and mandible formed for the reception and support of the roots of the teeth. When a tooth is removed from its process an opening is left that resembles in outline the shape of the root. This cavity or socket is called an *alveolus.* The alveolar process is composed of an inner and an outer plate of compact bone. Between these two plates the bone is less compact, being of a spongy or cancellous nature. The inner plate of compact bone approximates the roots of the teeth and is called the *peridental lamella.* That portion of the alveolar process which lies in the bifurcation of the roots of multirooted teeth or between the roots of two adjacent teeth is called the *septum.* Surrounding the root and separating it from the bony wall of the socket is a layer of fibrous connective tissue known as the *peridental membrane*, which has the important function of binding the tooth to the surrounding bone. Covering the alveolar process and investing the necks of the teeth is a firm tissue called the *gingiva*, or gum. (See fig. 10.)

g. In structure, a tooth is composed of four tissues, the enamel, dentin, cementum, and the dental pulp.

(1) *Enamel.*—Enamel is the hard, calcified, glistening substance which covers the crown of a tooth. It is thickest at the biting surfaces of the teeth, where it is most required to resist the stress of mastication, and gradually thins out as it approaches the neck, where it is, in most instances, slightly overlapped by the cementum. The enamel is the hardest tissue of the body and is composed of a series of prismatic rods held together by a cementing substance which, like the rods, is composed chiefly of inorganic salts.

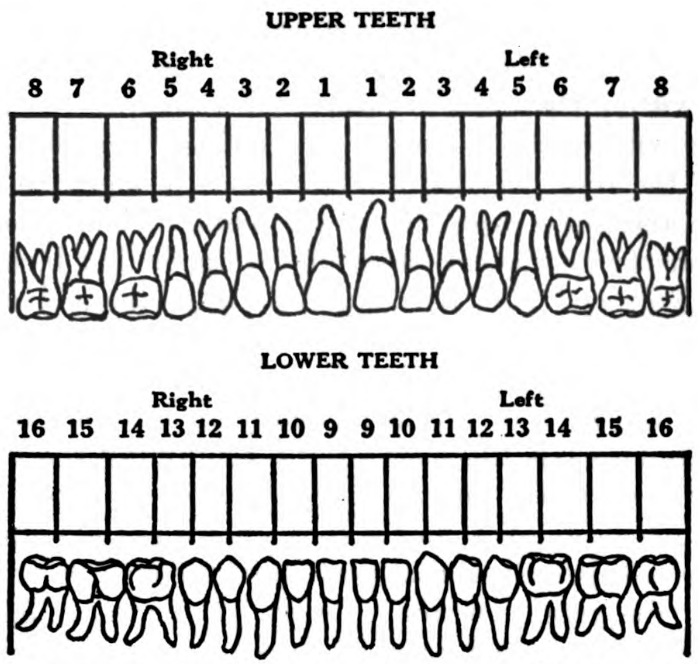


FIGURE 8.—Numerical designation of permanent teeth as used in the United States Army.

(2) *Dentin.*—Dentin is the hard, calcified, yellowish substance that makes up the mass of the tooth, giving to the tooth its general form. The dentin matrix is highly resilient and tough and gives strength to the tooth. Extending throughout the matrix and radiating from the pulp cavity are minute tubules, containing the *dentinal fibrils* which are protoplasmic extensions from the outermost layers of cells of the dental pulp. In the center of the dentin, extending the whole length of the root and into the crown of the tooth, is the pulp cavity.

(3) *Cementum.*—Cementum is the calcified tissue covering the root portion of the tooth, which closely resembles bone in structure. It is arranged in concentric layers around the tooth root varying in thickness according to the position on the root, being thinnest at the neck and thickest at the apex. The cementum gives attachment to the fibres of the peridental membrane holding the tooth firmly in its socket.

(4) *Dental pulp.*—The dental pulp, often called the nerve on account of its sensitiveness, occupies the central cavity or pulp chamber and canal of a tooth. It is composed of embryonic connective tissue,

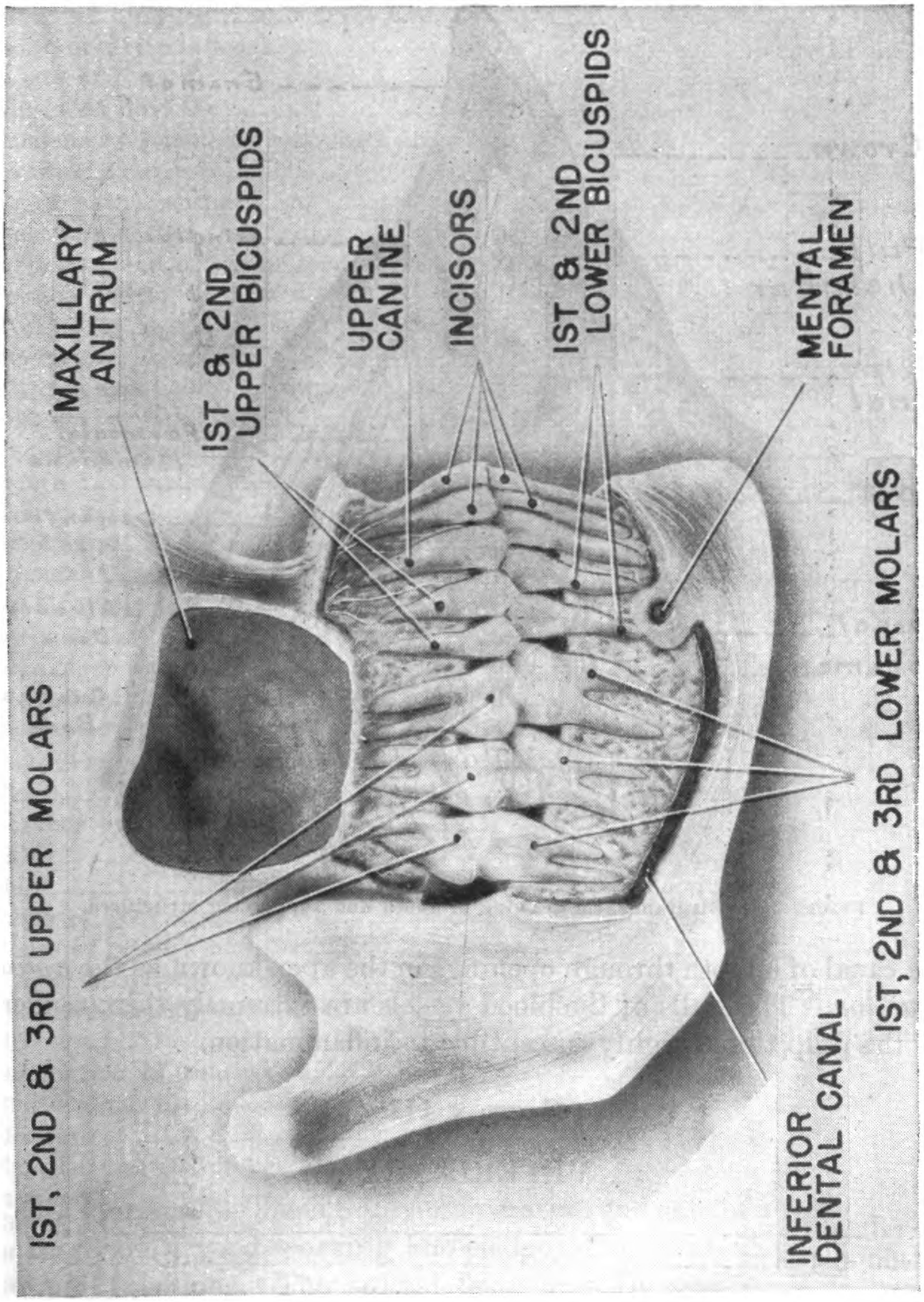


FIGURE 9.—Occlusion of the teeth and their position in the jawbones.

rich in blood vessels and nerves. Lying along the outer border of the pulp in contact with the dentin wall is a layer of specialized connective cells, the *odontoblasts*, which have the important function of forming

dentin. Protoplasmic processes from these cells pass into the dentinal tubules and have the property of transferring sensations of pain to the nerve fibrils within the pulp. Blood vessels and nerves enter the

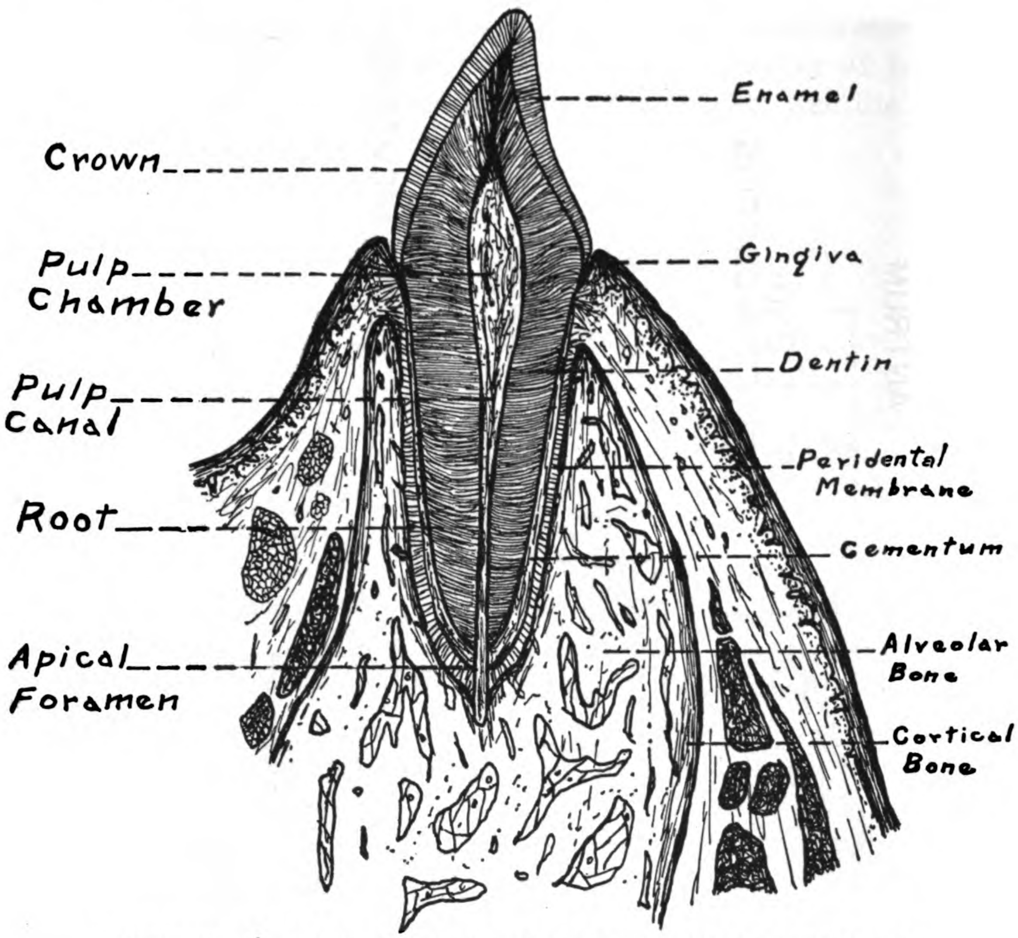


FIGURE 10.—Diagrammatic drawing of tooth and supporting structures.

root canal of a tooth through openings in the apex known as the *apical foramina.* The walls of the blood vessels are extremely thin, rendering the pulp tissue highly susceptible to inflammation.

SECTION III

VETERINARY

63. General.—The intelligent operation and care of any mechanism is based on a good working knowledge of its general structure and normal functions. The animal body may be considered as a complex machine of many parts, with each of these various parts normally functioning in a more or less definite manner. The science which treats of the form and structure of the animal body is

known as *anatomy*. The science which treats of the normal functioning of the animal body is known as *physiology*. It is quite essential that the study of animal management include a basic knowledge of the anatomy and physiology of the horse, in order that the student may more intelligently recognize the reasons upon which the fundamental principles of animal management are based. In this text the study of anatomy and physiology will be correlated as much as possible and limited to those parts of greatest essential interest. The body of the horse is in general structure quite like the body of man. Their chief differences are in the relative size and relationship of the various parts, and for these reasons the various structures of the horse will in many instances be compared with the similar parts of the human body. The body of the horse, like that of man, is made up of a skeletal system, a muscular system, a digestive system, a respiratory system, a circulatory system, a nervous system, a urinary system, a reproductive system, and an outer covering of skin and hair.

64. **Skeletal system.**—The skeletal system includes the bones and the ligaments which bind bones together to form joints. The skeletal system gives the body form and rigidity and forms cavities for the protection of vital organs. Bones and joints together form a complex system of levers and pulleys which, combined with the muscular system, gives the body the power of motion. The relative size and relationship of position of the bones determines the real form or conformation of the horse and his efficiency for any particular work. The trunk or axial skeleton consists of the skull, spinal or vertebral column, ribs, and breast bones. The limbs or appendicular skeleton support the body and furnish the levers of propulsion.

65. **Bones.**—*a.* The skeleton of the horse is made up of about 205 bones. In their living state bones are composed of about one part of organic matter and two parts of inorganic matter. The latter, which is mineral matter, is largely lime salts. The bones, as you see them in the mounted skeleton, have been freed of organic matter and are white and brittle, but living bone is about twice as strong as a green oak stick of the same size. Bones, according to their shape, are classified as long, short, flat, and irregular.

(1) *Long* bones are found in the limbs, where they support the body weight and act as the levers of propulsion.

(2) *Short* bones occur chiefly in the knee and hock, where they function in the dissipation of concussion.

(3) *Flat* bones, such as the ribs, scapula, and some of the bones of the skull, help to inclose cavities containing vital organs.

(4) *Irregular* bones are such bones as the vertebrae and some bones of the skull.

b. All bones are covered with a thin, tough membrane called *periosteum* except at points of articulation where they are covered with *cartilage.*

(1) The periosteum is closely attached to the bone. It covers and protects the bone and influences the growth of the bone to a certain extent. This latter function is of particular interest, for we know that injury to this membrane often results in an abnormal bone growth called an *exostosis*, occurring at the point of injury. Bone growths, such as splints, spavins, and ringbones, are the frequent result of some form of injury to the periosteum. The bone is in part nourished by blood vessels in the periosteum and there are many nerve endings in this membrane.

(2) The articular or joint surfaces of bones are covered with a dense, very smooth, bluish-colored substance called cartilage. The cartilage diminishes the effects of concussion and provides a smooth joint surface offering a minimum of frictional resistance to movement.

66. Skeletons of horse and man.—See figure 11. The same letters and figures indicate corresponding parts in each skeleton.

67. Bones of skull.—There are 34 bones in the skull and it is divided into two parts, the *cranium* and the *face.*

a. The bones of the *cranium* are all flat or irregular bones and surround the *cranial cavity* which contains the brain. This cavity is relatively small considering the size of the animal. The bones join each other in immovable joints. The bone forming what is known as the *poll* has an articulating surface where the head is jointed to the vertebral or spinal column. Together with the bones of the face, the cranial bones form the *orbital* and *nasal cavities.*

b. The bones of the face form the framework of the mouth and nasal cavities and include the more important bones of the upper and lower jaws, known as the *maxillae* and *mandible* respectively.

(1) Each *maxilla* has six irregular cavities for the reception of the cheek or molar teeth. From the maxillae forward the face becomes narrower and terminates in the *premaxilla*, which contains cavities for the six upper *incisor* teeth. Inclosed in each maxilla is a cavity known as the *maxillary sinus*, which opens into the nasal passages. This sinus contains the roots of the three back molar teeth and at times becomes infected, due to diseased teeth.

(2) The *mandible*, or lower jaw, is hinged to the cranium on either side by a freely movable joint in front of and below the base of the

S. Shoulder joint.
E. Elbow joint.
W. Knee joint of horse, wrist joint of man.
H. Hip joint.
K. Stifle joint of horse, knee joint of man.
A. Hock joint of horse, ankle joint of man.
1. Skull.
2. Mandible or jaw.
3. Atlas.
4. Axis.
5–9. Cervical vertebrae.
10–27. Thoracic vertebrae.
28–33. Lumbar vertebrae.
34–38. Sacral vertebrae.
39–56. Coccygeal vertebrae.
57. Ribs.
58. Scapula or shoulder blade.
59. Humerus.
60. Ulna.
61. Radius.
62. Small metacarpal or splint bone. } Hand bones of man.
63. Large metacarpal or cannon bone. }
64. First phalanx (long pastern bone). } Finger bones of man.
65. Second phalanx (short pastern bone). }
66. Third phalanx (coffin bone). }
67. Os coxae or hip bone.
68. Femur.
69. Patella (kneecap of man).
70. Tibia.
71. Fibula.
72. Small metatarsal or splint bone. } Foot bones of man.
73. Large metatarsal or cannon bone. }
74. First phalanx (long pastern bone). } Toe bones of man.
75. Second phalanx (short pastern bone). }
76. Third phalanx (coffin bone). }

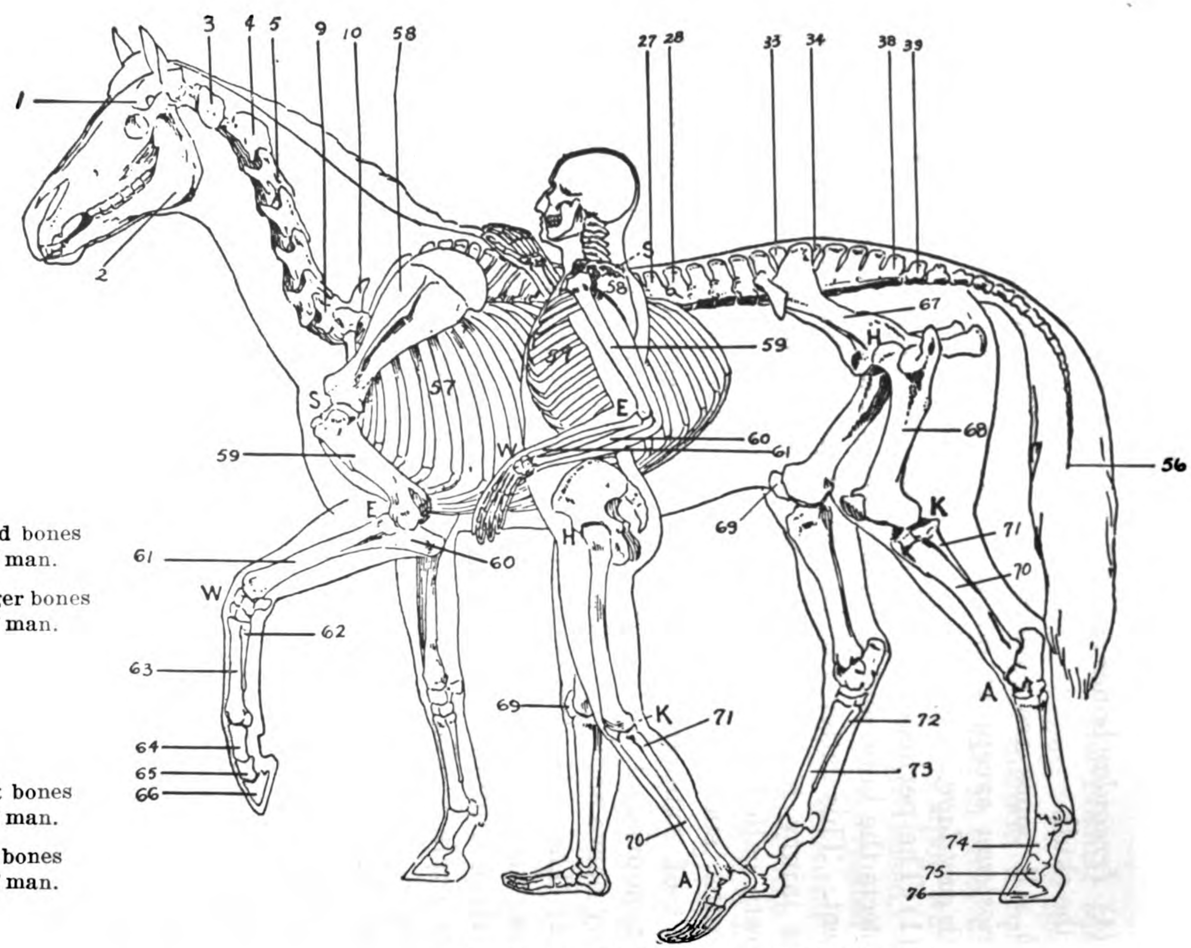


FIGURE 11.—Skeletons of horse and man.

ear. At its front extremity it has cavities for the six lower incisors. Back of the incisors is a space between the incisors and the six lower molars in each side of the mandible known as the *interdental space*. Injuries to periosteum or possible fracture of the mandible may occur in the interdental space due to rough usage of the bit. The space between the branches of the lower jaw is occupied by the tongue and important salivary and lymph glands.

68. Vertebral or spinal column.—The vertebral or spinal column may be regarded as the basis of the skeleton from which all other parts originate. It is composed of irregularly shaped bones bound together with ligaments and cartilage and forms a column of bones from the base of the skull to the tip of the tail. Through the length of this column is an elongated cavity called the *spinal canal* that contains the *spinal cord*, which is the main trunk-line of nerves coming from the brain lying in the cranial cavity. Through this more or less flexible column of bones the powerful impetus of propulsion originating in the hind legs is transmitted to the forequarters of the animal and indirectly it bears the weight of the rider and his equipment. The bones of the vertebral column are divided into five regions as follows:

a. The *cervical*, or neck, region contains seven cervical vertebrae. The first of these, the *atlas*, is jointed to the cranium by a hinge-like joint permitting only extension and flexion of the head on the neck. The next cervical vertebra is known as the *axis* and is so jointed to the atlas that it permits of rotation of the head and atlas on the remainder of the neck. The remaining five cervical vertebrae have no special names. The column of bones in this region is arranged, when viewed from the side, in an S-shaped curve. Lengthening and shortening of the neck is brought about by lessening or increasing this curvature. The cervical region is the most flexible part of the vertebral column and from the viewpoint of the student of equitation the possible movements of the head and neck are of great importance.

b. The *thoracic* region contains 18 *thoracic vertebrae*. These vertebrae form in part the upper wall of the chest cavity. Each vertebra has on either side an articulating surface for jointing to its corresponding pair of ribs. Each vertebra has on its upper surface a spine or process of bone called the *spinous process*. These processes vary in length. They increase rapidly in length from the first to the fourth and fifth, which are the longest, and form the summit of the withers, and then decrease in length. Movement in this part of the vertebral column is somewhat limited.

c. The *lumbar* region contains six *lumbar* vertebrae, sometimes five, especially in the Arab horse. This part of the column forms the framework or the loin. Movement in this part of the vertebral column is much greater than in the thoracic portion.

d. The *sacral* region contains five *sacral* vertebrae. These five bones are fused or grown together and may be considered as one bone, the *sacrum*, the highest point of which forms the summit of the croup. The sacrum is jointed very securely to the hip bones on either side and through these joints the propulsive impulses from the hind legs are transmitted to the vertebral column.

e. The *coccygeal* region contains from 15 to 21 *coccygeal* vertebrae which form the bony column of the tail. The spinal canal is practically absent in this part of the vertebral column.

The vertebral formula of the horse is C7T18L6S5Cy15–21. The vertebral formula of man is C7T12L5S5Cy4.

69. Bony thorax (chest).—The bony thorax is a large cavity formed by the thoracic vertebrae above, the ribs on the sides, and the *sternum* (breastbone) forming the floor. This cavity contains the heart, lungs, large blood vessels and nerves, and part of the trachea and oesophagus. Depth of this cavity with moderate width is desirable.

70. Ribs.—The horse has 18 pairs of *ribs*, all of which are jointed to the thoracic vertebrae at their upper ends. The lower ends of the first eight pairs, called *true* or *sternal* ribs, are jointed by means of cartilage to the sternum or breastbone. The last ten pairs, called *asternal* or *false* ribs, are at their lower ends continued by extensions of cartilage which are bound to each other by elastic tissue. The shape and length of the ribs determine the contour of the chest. The ribs form the direct skeletal support of the saddle.

71. Sternum.—The *sternum*, or breastbone, is a canoe-shaped bone consisting of seven or eight bony segments connected by intervening cartilage. The sternum forms the floor of the thorax and the front end of the bone forms the bony prominence in the midline of the breast.

72. Bones of foreleg.—The bones of the foreleg named from above downward are the *scapula*, *humerus*, *radius*, and *ulna*, *carpal* bones, three *metacarpal* bones, *first phalanx*, *second phalanx*, *third phalanx*, and the *proximal* and *distal* (navicular) *sesamoid* bones.

a. The *scapula*, or shoulder blade, is a triangular flat bone in the region of the shoulder and lies on the side of the thorax. Along its upper border, or the base of the triangle, is attached a thin, flat, and

flexible cartilagenous extension. When the leg is extended to the front the edge of this cartilage may slip under the front of the bar of the saddle without injury to the shoulder blade. The direction of this bone is sloping downward and forward. If the direction of this bone approaches vertical the shoulder is said to be straight or upright, which is not favorable for length and freedom of the forward movement of the foreleg. The scapula is attached to the thorax only by muscles, there being no bony union with the sternum, ribs, or spinal column. In man the scapula is jointed to the sternum through the *clavicle* or collarbone, a bone that is entirely absent in the skeleton of the horse. The lower end of the scapula is jointed to the humerus.

b. The *humerus* is the bone of the arm and extends downward and backward from the shoulder joint to the elbow. The humerus is surrounded with heavy muscles and is attached by muscles to the wall of the thorax. Because of its muscular protection and position, this bone is not often injured. In man the humerus or arm bone is much freer of the body and has a much greater range of movement in the shoulder joint.

c. The *radius* is the bone of the forearm and with the ulna and humerus forms the elbow joint. The *ulna* is a short bone which is fused to the upper part of the radius and also projects above the end of the radius to form the point of the elbow. In man the ulna is comparatively longer and extends, on the little finger side, with the radius to the wrist joint. The long axis of the radius should be vertical.

d. The *carpal* bones, or knee bones, correspond to the wrist bones of man. There are seven or eight carpal bones arranged in two rows. The top row articulates with the lower end of the radius and most of the movement of the knee joint is confined to this articulation. The top and bottom rows articulate with each other and the bottom row also with the upper ends of the metacarpal bones. A great deal of concussion transmitted up the bony column from below is absorbed and dissipated by the carpal bones.

e. The horse has three *metacarpal* bones. The large middle metacarpal bone (cannon bone) extends from the knee to the fetlock and is sometimes known as the third metacarpal. Because of the great strength of this bone it is seldom fractured although it is one of the most exposed bones of the skeleton. In his early evolutionary state the horse was a fivetoed animal, but during his development to his present form he has lost the two inner and two outer toes and only the two splint bones or *small metacarpals* persist as vestigial remains of

the original second and fourth metacarpals. These small metacarpals are located on the internal and external posterior borders of the large metacarpal. Their upper ends articulate with the lower row of carpal bones. As they are only about three-fourths as long as the large metacarpal, they have no direct support at their lower end but where they are in contact with the large metacarpal they are closely bound to it by the strong *interosseous ligament*. Strains of this ligament result in the condition known as splints. After a horse is about 7 years of age this ligament begins to ossify and, in old animals, the splint bones may be firmly fused to the cannon bone. The long axis of the cannon bone should be vertical.

f. The *first phalanx*, or long pastern bone, corresponds to the first bone of the long finger of man.

g. The *second phalanx*, or short pastern bone, corresponds to the second bone of the long finger of man.

h. The *third phalanx*, or coffin bone, corresponds to the bone in the tip of the finger and is completely inclosed in the hoof which is analagous with the fingernail of man. The general shape of the coffin bone is very similar to the shape of the hoof. The three phalanges have their long axis in prolongation of each other and their direction is downward and forward so that the inclosed angle with horizontal in the foreleg is about 50°. If the phalangeal column of bones approach the vertical, the horse is said to have upright or stumpy pasterns, and in such a case greater concussion is imparted directly to the bony column. Upright pasterns are often associated with a straight or upright shoulder. When the slope of the region is greater than average an undue amount of strain is thrown on the flexor tendons and suspensory ligament.

i. The *sesamoids* are two pyramidal-shaped bones that form a part of the fetlock joint and articulate with the posterior part of the lower end of the cannon bone. They lie imbedded in ligaments and cartilage and form a bearing surface over which the flexor tendons lie.

j. The *distal sesamoid*, or *navicular* bone, is situated back of the coffin bone and articulates with the lower end of the second phalanx. The deep flexor tendon plays over its lower surface. This point is the seat of navicular disease.

73. Os coxae or hip bone.—The *os coxae*, or hip bone, is a paired bone and each unites with its fellow of the opposite side at the lowest point to form the floor of the pelvic cavity. Each hip bone is firmly jointed to the sacrum. This girdle of bone is called the pelvic girdle and incloses the pelvic cavity. Each hip bone bears on its side a cavity where the femur, or first bone of the hind leg, is jointed

to it. The outer front angle of the hip bone forms the point of the hip, or haunch, which is often injured. The inner front angle, together with the sacrum, forms the point or summit of the croup. The back angle of the hip bone forms the point of the buttock. A long and flat (approaching horizontal) pelvis is most suitable for speed and freedom of movement of the hind legs.

74. **Bones of hind leg.**—The bones of the hind leg named from above downward are the *femur*, *patella*, *tibia* and *fibula*, six or seven *tarsal* bones or bones of the hock, *large metatarsal* (cannon bone), two small *metatarsals* or splint bones, *first phalanx*, *second phalanx*, *third phalanx*, and the *proximal* and *distal* (navicular) *sesamoid* bones.

a. The *femur*, or bone of the thigh, corresponds to the thigh bone of man. At its upper end this bone articulates with the hip bone in the hip joint and extends downward, forward, and slightly outward to the stifle joint. Viewed from the side, the inclosed angle between the long axis of this bone and horizontal is about 80°.

b. The *patella* is a small bone lying on the front of the stifle joint and articulating with the lower end of the femur. It corresponds to the kneecap of man.

c. The *tibia* is the second long bone of the hind leg and lies in the region known as the leg or gaskin. It extends from the stifle joint downward and backward to the hock joint, forming an inclosed angle with horizontal of about 65° to 70°. A position approaching vertical is more favorable for speed of movement than one of considerable slope. This bone along its inner surface has but a thin protective covering of skin and other tissue, and because of its exposed position is the most frequently fractured bone in the horse's skeleton. This bone corresponds to the shin bone of man. The *fibula* in the horse is a small rudimentary bone about two-thirds as long as the tibia and is attached to the upper and outer surface of the tibia. In man this bone, as well as the tibia, extends from the knee to the ankle.

d. The hock or *tarsas* of the horse, like the ankle of man, contains six or seven *tarsal* bones arranged in a manner similar to the carpal bones of the knee. The largest of these extends upward from the back of the joint and forms the bony prominence known as the point of the hock, and serves as a point of attachment of the powerful tendon of Achilles.

e. The *metatarsal* bones correspond to the metacarpal bones of the foreleg. The hind cannon extends downward and slightly forward

at an angle of about 87°. The hind cannon is about one-sixth longer than the fore cannon, and is also more nearly round.

f. The *phalanges* and *sesamoids* of the hind leg are very similar to those of the foreleg, except that the phalangeal axis is inclined to be slightly more upright.

75. Joint or articulation.—*a. Classification.*—Joints are classified according to structure and mobility into three types.

(1) *Immovable*, in which the opposed surfaces of bone are directly united by connective tissue or fused bone, permitting no movement, such as between the bones of the cranium.

(2) *Slightly movable*, where a pad of cartilage, adherent to both bones, is interposed between the bones and a slight amount of movement is possible due to the elasticity of the cartilage. Many of the joints between the vertebrae are of this character.

(3) *Freely movable*, when a joint cavity exists between the opposed surfaces. The joints of the legs are examples of this type.

b. Structure.—The freely movable joints are the truest examples of joints. The ends of the bones entering into a freely movable joint are held in opposition to each other by strong bands of tissue called *ligaments*, which pass from one bone to the other. Ligaments possess but a slight degree of elasticity and have a limited blood supply, which accounts for the fact that they heal very slowly and often imperfectly following an injury. In freely movable joints the ends of the bones are covered with smooth cartilage, which absorbs concussion and provides a smoother bearing for the ends of the bones. In freely movable joints the entire joint is inclosed in a fibrous sac, called the *joint capsule*, which assists the ligaments in holding the bones in position. Its inner surface is lined with a thin secreting membrane called the *synovial membrane*, which secretes a fluid called *synovia* or "joint water." Synovia is a clear and slightly yellowish fluid of much the appearance and consistency of the white of a watery egg. This fluid serves to lubricate the joint in the same way that oil lubricates a bearing. Normally the amount secreted is limited to only the actual amount necessary to prevent friction in the joint. In joints that are inflamed as a result of undue concussion or from other causes, the amount secreted is increased and results in a distention of the joint capsule. Where the capsule is not closely bound to the joint by the ligaments, the distended capsule will pouch out under the skin as a soft swelling. A bog spavin is an example, as are also certain windgalls. Wounds over a joint are always likely to be dangerous for they may have opened the joint cavity. When the joint cavity is opened the synovia flows from the wound and the synovial membrane

is stimulated by the loss of the synovia to secrete more. This synovia pouring over the wound surface retards healing and the joint cavity becomes readily infected. An open joint is usually very painful and in a great many instances results in the permanent disability of the animal, even with the best possible care. The hock joint is most frequently opened by accidental injury.

76. Joints of foreleg.—The joints of the foreleg named in order from above downward are the *shoulder*, formed by the scapula and humerus; the *elbow*, formed by the humerus, radius and ulna; the *knee*, formed by the radius, carpal bones, and the three metacarpal bones; the *fetlock*, formed by the cannon bone or large metacarpal, two sesamoid bones, and the first phalanx or long pastern bone; the *pastern*, formed by the first and second phalanges (long and short pastern bones); and the *coffin*, formed by the second and third phalanges (short pastern and coffin bones) and the navicular bone.

77. Joints of hind leg.—The joints of the hind leg named in order from above downward are the *hip*, formed by the hip bone and femur; the *stifle*, formed by the femur, patella, and tibia; and the *hock*, formed by the tibia, the tarsal or hock bones, and the three metatarsal bones. The remaining joints of the hind legs are named and formed the same as the corresponding joints of the foreleg.

78. Suspensory ligaments and check ligaments.—In addition to the ligaments which form a part of the joints, there are certain other important body ligaments.

a. The *suspensory ligament* of the foreleg is a very strong, flat ligament arising from the back of the knee and upper end of the cannon bone and passing down the back of the leg, lying in the groove between the splint bones. A short distance above the fetlock the ligament divides into two diverging rounded branches, each branch attaching to the upper and outer part of its corresponding sesamoid bone and then passing downward and forward around the front of the long pastern bone to join its fellow in a point of union with the extensor tendon which attaches to the front of the coffin bone. From the lower part of the sesamoids, bands of ligament pass downward and attach to the back of the long and short pastern bones. From its nature of attachment, it is readily seen that the suspensory ligament is a remarkable sling-like or truss apparatus by which the fetlock is supported, concussion diminished, and the phalangeal axis mechanically held in its sloping position.

b. The *check ligament* is a short, strong ligament arising on the back of the upper end of the suspensory ligament, just below the

knee, and passing downward and backward for a short distance to where it attaches to the *deep flexor tendon*, which passes down the back of the leg to a point of attachment on the under surface of the coffin bone. When the muscle above is relaxed, it is easily seen that the check ligament by its action really functionally converts the part of the tendon below the check ligament into a ligament which assists the general action of the suspensory ligament.

c. The suspensory ligament is considerably more elastic than are the binding ligaments of joints and by its supporting springlike action it absorbs a great deal of concussion. This ligament is most frequently injured in horses that do a great deal of their work at the gallop. The suspensory ligament in the hind leg is very similar to that of the foreleg, but the check ligament is much less perfectly developed.

79. Plantar ligament.—The *plantar ligament* is a strong band of ligamentous tissue on the back of the hock bones. It extends from the point of the hock to the upper end of the cannon bone and, by its strong attachments to the small hock bones, braces the hock against the strong pull of the tendon of Achilles. It is of particular importance because it is sometimes injured, resulting in the unsoundness known as *curb*.

80. Ligamentum nuchae.—The *ligamentum nuchae*, or ligament of the neck, is a fan-shaped ligament of very elastic tissue extending from the poll and upper surfaces of the cervical vertebrae backward to attach to the longest spines of the thoracic vertebrae (withers). It assists the muscles of the neck in maintaining the head and neck in position. It is of particular interest because the withers or poll is sometimes injured, resulting in the serious conditions of *fistulous withers* and *poll evil*.

81. Muscular system.—See paragraph 22.

82. Structure and action of muscles.—*a*. All voluntary muscles are composed of a *contractile* portion called the body or belly of the muscle and a *noncontractile* continuation called the *tendon* which is a modified continuation of one end of the body or contractile portion of the muscle. The contractile portion of the muscle is made up of many elongated muscle cells lying side by side lengthwise of the muscle, which when stimulated becomes shorter and thicker. The *tendon* of a muscle is in structure quite similar to that of a ligament and its function is to transmit the power of the muscle to some definite point of movement. The contractile portion has a large blood supply, but the blood supply of the denser tendons is rather limited.

b. The body of most muscles is attached to some bone and the point of attachment is called the *origin*, while the tendon may pass one or more joints and attach (*insertion*) to some other bone.

c. For almost every muscle or group of muscles having a certain general action, there is another muscle or group of muscles whose action is the exact opposite. The most important examples are the *extensor* and *flexor* muscles of the legs. A muscle is an *extensor* when its action is to extend a joint and bring the bones into alinement. A muscle is a *flexor* when its action is to bend the joint. Some muscles, if their points of origin and insertion are separated by two or more joints, may act as a flexor of one joint and an extensor of another joint. Except to establish fixation and rigidity of a part, such opposed muscles do not act simultaneously in opposition to each other, but act successively. There are hundreds of muscles in the body and their actions are very complex, but in this text we will consider only the general action of the important muscle groups.

83. Tendon sheaths and bursae.—Many muscles, especially those of the legs, have long tendons which pass one or more joints and undergo changes of direction or pass over bony prominences before reaching their point of insertion. To avoid undue friction at these points and to allow the muscle to act most efficiently, nature has supplied *tendon sheaths* and *tendon bursae* at various points of friction along the course of the tendon. A *tendon sheath* is a synovail sac through which a tendon passes. The inside of the sac secretes synovia and lubricates the tendon. A *tendon bursae* is a synovial sac which is interposed between the tendon and the surface over which it passes in change of direction. It serves the same purpose as a tendon sheath but differs from it in that the tendon is not surrounded by the synovial sac. These tendon sheaths and tendon bursae are found chiefly near joints. The synovial membrane and synovia secreted are the same as those found in joints. Due to chronic irritation from hard work or as a result of injury, the amount of synovia secreted may be greatly increased and result in a distension of the sac characterized externally by a circumscribed puffy swelling. Such swellings are often seen above the fetlocks where they are called wind puffs or windgalls. While they seldom cause distinct lameness, they are evidence of a so-called "second-handed" condition and indicate that the horse probably is a little stiffened and shortened in his gaits.

84. Muscles of neck and attachment of foreleg.—*a.* We have learned from the study of the skeleton that the foreleg of the horse

has no bony connection with the remainder of the skeleton. The foreleg is attached to the body by a very complex system of muscles which extend from the leg along the side of the neck to the poll, upward to the withers, backward along the sides of the chest, and back and under the chest to meet at the sternum. The fore part of the horse is really suspended between two uprights, the forelegs, and by this elastic muscular sling a very efficient shock-absorbing mechanism is provided. As the forelegs bear from 9 to 20 percent more of the body weight than do the hind legs, it is easy to understand the importance of this muscular attachment, especially in the riding horse.

b. The long muscles that extend from the region of the shoulder to the sides of the neck and to the head are of special interest to the student of equitation, for the manner of the movement of the horse is profoundly influenced by their action. With the shoulders fixed these muscles by their action cause movement of the head and neck and, when the head and neck is fixed by opposing muscular action, these muscles act to advance the shoulder. With the head and neck extended, these muscles are most favorably placed for maximum extension of the shoulder and foreleg with a low and extended action. A high head carriage with shortening of the neck is most favorable for maximum elevation of the shoulder and foreleg, resulting in a higher and shortened stride. Much of the early training of the remount is directly aimed at gaining suppleness and control of the action of this group of muscles.

85. Muscles of back, loin, and croup.—The triangular space between the ribs, the transverse processes of the lumbar vertebrae, and the spines of the thoracic and lumbar vertebrae is filled with large muscles. The principal one of this group is the largest and longest muscle of the body, *longissimus dorsi*, extending from the posterior part of the loin along the back and down between the shoulder and thorax to the last cervical vertebrae. These muscles, one on each side, are used extensively when the horse elevates its hindquarters in kicking or when rearing. Acting singly, the muscles flex the vertebral column laterally. In the thoracic region, this muscular pad bears the weight of the saddle when the horse is ridden and distributes the weight evenly to the supporting ribs. The croup and thighs are made up of groups of powerful muscles which are the chief sources of propelling power.

86. Muscles and tendons of lower leg.—*a*. The extensor muscles of the foreleg attach mainly to the humerus and radius and lie on the front of the forearm.

(1) The *common digital extensor* originates on the lower end of the humerus and upper part of the radius. At the upper part of the knee the muscle continues as a tendon along the front of the knee, cannon, and pastern regions to its point of insertion on the upper end of the coffin bone. In the pastern region two branches of the suspensory ligament unite with the tendon. This muscle acts as extensor of all joints below the elbow but flexes the latter. This tendon is seldom injured.

(2) The *extensor of the knee* is a strong muscle attached to the humerus and lying on the front of the forearm, having a short heavy tendon which passes over the knee and attaches to the upper end of the cannon bone. It extends the knee joint and flexes the elbow. The tendon passes through a tendon sheath extending from the middle of the knee to about 4 inches above the knee. This region is often bruised in jumping horses, resulting in a synovial distention of the sheath commonly called "jumping knee." While unsightly, it seldom causes lameness.

b. The flexor muscles of the foreleg lie on the back of the forearm and like the extensors originate on the humerus, ulna, and radius.

(1) The *superficial digital flexor* originates on the lower end of the humerus and its fleshy portion extends to the lower part of the forearm and from that point continues as a flattened tendon which passes down the back of the leg and below the fetlock divides into two branches which are inserted on either side of the upper end of the short pastern bone. This muscle flexes the knee, fetlock, and pastern. The tendon lies just under the skin on the back of the leg and just back of the deep flexor tendon.

(2) The *deep digital flexor* originates with the superficial digital flexor. The body of the muscle lies on the back of the forearm and from just above the knee continues as the deep flexor tendon and passes down the back of the leg in front of the superficial flexor tendon, passes between the branches of the latter, and continues to its point of insertion on the under surface of the coffin bone. This muscle is the most powerful flexor of the foreleg. In the upper part of the cannon region, this tendon is joined by the check ligament (see par. 78). Where the tendon passes over the back of the sesamoid bones at the fetlock joint, it is inclosed in a tendon sheath. This sheath frequently becomes distended with synovia forming windgalls or wind puffs. This tendon also passes over a bursa where it glides over the navicular bone near the coffin joint, and injury to this bursa results in the condition known as *navicular disease*.

In the cannon region the two tendons described above appear to the eye as one large rounded tendon, but if the foot is raised and the structure examined with the fingers the separate tendons can be readily distinguished. These two muscles and their tendinous extensions, in addition to bringing about movements of the leg, act also as shock absorbing mechanisms. The strains to which they are subjected seldom injure the bodies or bellies of the muscles, but the tendons are not uncommonly injured by strain, particularly in the cannon region, and the resulting inflamed condition is known as *tendinitis*. Either or both tedons may be affected, the deep flexor most frequently.

c. The general arrangement and action of the extensor and flexor tendons of the hind leg from the hock joint downward are almost identical with those of the foreleg. Tendinitis in the hind legs is uncommon because of the lesser amount of weight borne and concussion absorbed. Distention of the tendon sheath at and just above the fetlock often occurs, but the navicular bursa is rarely diseased. The navicular bursa of the hind leg, as in the foreleg, is sometimes opened by a nail's penetrating from the under surface of the foot.

87. Fatigue of muscles.—*a*. Fatigue of the muscles follows continued work. This is due principally to the consumption of substances from which energy is derived and results in exhaustion. As soon as the accumulated waste products are removed by the blood and lymph, and a fresh supply of nutrition is brought to the muscles, a feeling of fitness again prevails. Hand-rubbing the legs of a horse is beneficial, because the blood and lymph vessels are stimulated to increased activity in the removal of waste products and cause the blood to circulate more freely. Fatigue may also be overcome, in part, by providing a feed of easily digested carbohydrates, which furnishes a maximum of energy.

b. A green horse, that is, one not accustomed to steady work, fatigues much more easily than a hardened horse. This is due to the muscles of the former being softer and possibly carrying an excess of fat. It should be remembered that there is a limit to continued muscular effort, and that harmful fatigue can be avoided only by working the horse at a moderate rate in order to keep the proper balance between the products of muscular activity and the ability of the blood to remove its waste material. An animal should never be worked until exhausted, if for no reason other than that it is not economical.

88. Digestive system.—The digestive system is really a muscular tube passing through the body and having two external openings, the mouth and the anus. This tube has a total length of about 100 feet, looped on itself many times, dilated at intervals along its course, and

provided with several accessory organs. The entire tube is lined with *mucous membrane.* Mucous membrane is a modified form of skin, and this close relationship between the lining of the digestive tube and the covering of the body explains why digestive disturbances are often reflected in skin disturbances. The digestive organs are the *mouth*, *pharynx*, *esophagus*, *stomach*, *small intestine*, *large intestine*, and *rectum.* (See fig. 12.)

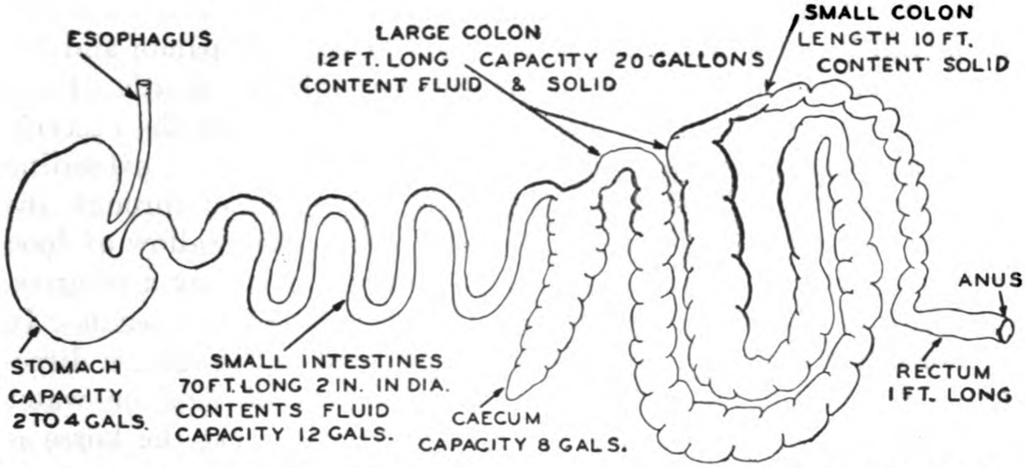


FIGURE 12.—Schematic diagram of digestive system (horse) (not drawn to constant scale).

89. Mouth.—The mouth extends from the lips to the pharynx. It is bound on the sides by the checks, above by the hard palate, and below by the tongue. Separating the mouth from the pharynx is the soft palate, a fleshy curtain suspended from the back part of the hard palate, which permits the passage of food and water from the mouth to the pharynx but prevents its passage in the opposite direction. The lips pick up loose feed and it is passed into the mouth by the action of the tongue. When the horse is grazing the feed is grasped with the incisor teeth. It is masticated or ground between the molar or cheek teeth and mixed with the *saliva.* The saliva is secreted into the mouth by the salivary glands, the largest of which is the *parotid* lying below the ear and back of the jaw. The horse is by nature a slow eater and requires from 15 to 20 minutes to eat a pound of hay and from 5 to 10 minutes to eat a pound of grain. Hay, when properly masticated, absorbs approximately four times its weight of saliva, and oats a little more than its weight. The saliva moistens and lubricates the mass for swallowing, and as a digestive juice acts on the starches and sugars. The ball of masticated feed, when ready for swallowing, is forced past the soft palate into the pharynx by the base of the tongue. Drinking is performed in the horse by drawing the tongue backward in the mouth, and thus using it as the piston of a suction pump. A horse

usually swallows slightly less than one-half pint at each gulp, and the ears are drawn forward at each swallow and drop back during the interval between swallows.

90. Pharynx.—The *pharynx* is a short and somewhat funnel-shaped muscular tube between the mouth and esophagus and is also in part an air passage between the nasal cavities and the larynx. The muscular action of the pharynx forces the food into the esophagus. Food or water after entering the pharynx cannot return to the mouth because of the trap-like action of the soft palate and for the same reason a horse cannot breathe through the mouth. Food or water returned from the pharynx passes out through the nostrils.

91. Esophagus.—The *esophagus* is a muscular tube extending from the pharynx down the left side of the neck and through the thoracic cavity and diaphragm to the stomach. The swallow of food or water is forced down the esophagus to the stomach by a progressive wave of constriction of the circular muscles of the organ. In the horse this wave of constriction cannot move in the reverse direction and vomiting is not possible. The return of food or water through the nostrils is almost a certain indication that the horse is choked and the esophagus is blocked by a mass of food.

92. Stomach.—The *stomach* is a U-shaped muscular sack which lies in the front part of the abdominal cavity and close to the diaphragm. The esophageal and intestinal openings are close together and for this reason water passes rather quickly through the stomach and small intestine to the first of the large intestines, the caecum, sometimes known as the water gut. Considering the size of the animal and the amount of food consumed, the stomach of the horse is relatively very small. The horse in his natural state was a slow but more or less constant eater and did not require a stomach of great storage capacity. The maximum capacity of the stomach is 3 to 4 gallons but it functions most efficiently when it does not contain over 2½ gallons. These facts have a decided influence on our methods of feeding. The small size of the stomach makes it imperative that food be given in relatively small amounts and at frequent intervals. Overloading of the stomach not only lowers its efficiency as a digestive organ but, by pressure against the diaphragm, makes breathing more difficult. The food on entering the stomach is arranged in layers, the end next to the small intestine filling first. The digestive process begins immediately upon receipt of food but no food leaves the stomach until it has been filled to about two-thirds of its capacity. While the animal continues to eat, the partially digested food passes out into the small intestine in a continuous stream. As a result two

to three times the capacity of the stomach may pass out during a bulky meal. The emptying process slows up only when feeding stops. The stomach never is completely empty except after complete withholding of food for 1 or 2 days. The contents of the stomach are squeezed and pressed by the muscular activity of the organ but its contents are never churned. The digestive juice secreted by the walls of the stomach is called gastric juice, an acid fluid containing the active digestive enzyme called pepsin which acts on the protein in the food. Some digested food is absorbed by the stomach but as a whole stomach digestion is partial preparatory digestion for more complete digestion in the intestines. The consumption of any considerable quantity of water during the period of stomach digestion tends to disarrange the layering of the food in the stomach and causes as much as one-half of the stomach contents to be washed into the small intestine. For this reason the horse should be *watered first and fed afterward*, unless he is allowed free access to water during his meal. As the food tends to leave the stomach in the order of its receipt, it is advisable to *feed some hay before feeding grain* so that the grain, being held longer in the stomach, undergoes more complete digestion.

93. Small intestine.—The *small intestine* is a tube about 70 feet in length, extending from the stomach to the caecum. The small intestine is about 2 inches in diameter and just after leaving the stomach is arranged in a distinct U-shaped curve which in the horse seems to prevent food returning to the stomach after it has once entered the intestine and also tends to close the opening into the intestine when the stomach is over-distended with food. The small intestine lies in folds and coils near the left flank and is suspended from the region of the loin by an extensive fan-shaped membrane called the mesentery. The partially digested food in the small intestine is always quite fluid in character and seems to pass rather rapidly through this part of the digestive tract. Digestion is continued in the small intestine by the action of the bile and pancreatic juice which are secreted by the liver and pancreas, respectively. Some digested food is absorbed in the small intestine.

94. Large intestine.—The large intestine is divided into the *caecum*, *large colon*, *small colon*, *rectum*, and *anus*.

a. The *caecum* is a large, elongated sack extending from high in the right flank downward and forward to the region of the diaphragm. The openings from the small intestine and to the large colon are close together in the upper end of the organ. This organ is sometimes known as the "water gut" for the reason that water

passes rather quickly to the caecum and because its contents are always liquid. Digestion is continued in the caecum and some food is absorbed.

b. The *large colon* is about 12 feet in length and has a diameter of 10 to 12 inches. It extends from the caecum to the small colon. This organ is usually distended with food; the greater part of digestion of food by the digestive juices and bacterial action take place in this part of the digestive tract and the greater part of absorption of digested food occurs.

c. The *small colon* is about 10 feet in length and 4 inches in diameter and extends from the large colon to the rectum. The contents of the small colon are solid and here the balls of dung are formed.

d. The *rectum* is that part of the digestive tract about 12 inches in length extending from the small colon through the pelvic cavity to the *anus*, which is the terminal part of the digestive tract.

95. Organs of respiration.—The organs of respiration comprise the *nasal cavity*, *pharynx*, *larynx*, *trachea*, *bronchi*, and *lungs*. The lungs are the essential organs of respiration; all of the other parts simply act as passages for the air to and from them.

a. The *nasal cavity* is bounded by the facial bones and begins at the nostrils, which are held open by cartilages. It is divided into halves by the cartilaginous nasal septum. Each half is partially filled with the thin turbinated bones, which are covered with a very vescular mucous coat. This coat serves to warm the inspired air.

b. The *pharynx*, as described before, is common to both the respiratory and digestive tracts.

c. The *larynx* is a short tube-like organ situated between the pharynx and the trachea. It regulates the amount of air passing to and from the lungs and helps to prevent the aspiration of foreign bodies. It is the seat of that common disease of the horse known as "roaring", which is a paralysis of the muscles controlling the vocal cords.

d. The *trachea* is a long tube connecting the larynx with the lungs and is located in the lower median border of the neck. It is composed of a series of cartilaginous rings held together by elastic fibrous material.

e. The *bronchi* are the branches of the trachea which connect the trachea with the lungs. They, in turn, branch into minute tubes, which penetrate every part of the lung tissue.

f. The *lungs* are two in number and nearly fill the thoracic cavity. The lung tissue is pinkish in color and will float in water. The

lung is made up of innumerable air cells having thin elastic walls which contain capillaries of the pulmonary circulation. This elasticity of the lung tissue permits the organ to contract and expand in the act of respiration. Heaves is caused by a breaking down of the walls of some of the air cells, with attendant loss of elasticity in that part of the lung.

96. Physiology of respiration.—Respiration is the act of breathing and is the most vital function of animals. It consists of an exchange of the oxygen in the air for the carbon dioxide in the blood and an interchange of these gases between the blood and the body tissues. The former is external respiration and the latter is internal respiration. External respiration consists of two movements, inspiration and expiration. Inspiration is brought about by a contraction of the diaphragm and an outward rotation of the ribs. Expiration is effected by relaxation of these muscles and contraction of rib and abdominal muscles. The abdominal muscles are used extensively in labored breathing. Since the diaphragm plays such an important part in the respiration movement, it follows that the distention of the digestive tract with bulky food materially interferes with normal breathing, especially when the animal is subjected to fast gaits. The lungs of the average horse contain, when freely distended, 1½ cubic feet of air. The normal horse at rest breathes from 8 to 16 times per minute, and inhales at each respiration approximately 250 cubic inches of air. A horse, while walking, nearly trebles the number of normal respirations, but the normal rate is regained in a very few minutes after the horse stops. If the animal breathes 10 times a minute, during repose, the whole lung is ventilated about once a minute. The amount of air required by the horse depends upon the extent of muscular work being performed. The following table shows the mean amount of expired air obtained from horses at various gaits:

Gait	*Cubic feet expired per hour*
Repose	74.17
Walk	133.55
Trot	287.87
Canter	391.00
Gallop	849.10

97. Organs of circulation.—The organs concerned with the circulation of blood and lymph are the *heart*, *arteries*, *veins*, *capillaries*, *lymph vessels*, and *lymph glands*.

a. The *heart*, the central organ of the system, is situated in the left half of the thorax, between the lungs and opposite the third to sixth ribs. In the ordinary-sized horse, it weighs from 7 to 8 pounds. It is inclosed in a sero-fibrous sac called the pericardium. The heart

is divided into four cavities, separated by muscular walls and valves. The action of the heart is to receive the blood and to pump it out to the lungs and body tissues.

b. The *arteries* have rather thick elastic walls and carry the blood from the heart to the tissues of the body.

c. The *veins* have much thinner walls and, in many cases, are equipped with valves to prevent the blood from flowing back. They carry the blood from the tissues to the heart. The veins of the legs afford an excellent example of valves in veins.

d. The *capillaries* are microscopic in size and function as connecting tubes between the arteries and veins. It is through the capillaries that the interchange of oxygen and food between the blood and tissues takes place.

e. The *lymphatics* consist of numerous well-defined groups of lymph glands and connecting vessels which are closely related to the arteries. The vessels all unite eventually to form one large duct, which is parallel to the aorta (main artery from the heart) and empties into one of the veins. The lymph glands are located at strategic places along the main vessels and act as filters for the lymph. They assume considerable importance in some diseases; strangles is one disease affecting these organs. The lymph assists in carrying food from the digestive tract to the body and transporting waste back to the blood stream.

98. Physiology of circulation.—The heart movements are controlled by an intricate group of nerves. The heart beat is the combined cycle of contraction and relaxation of the organ. In the normal horse at rest, the heart beats from 36 to 40 times per minute. The pulse rate is determined by counting the rate of pulsations in some artery that is easily palpitated; for example, the one at the angle of the lower jaw. The pressure and rate of flow in the veins is very slow when compared with that in the arteries. It is aided by the respiratory movements and muscular contractions. From these facts it is seen that good circulation is made possible by exercise. While the left side of the heart carries on the body circulation the right side pumps impure blood to the lungs to be purified before it returns to the left side of the heart for return to the body tissues. This latter is known as the pulmonary circulation.

99. Blood.—The blood is a red alkaline fluid, composed of blood plasma and red and white corpuscles. It clots almost immediately when exposed to the air. The total amount is about one-fourteenth the weight of the body. The white corpuscles are active agents in combating disease germs in the body. The red corpuscles originate in the red bone marrow, liver, and spleen. They carry oxygen from the

lungs to the tissues, convey waste away from the tissues, distribute heat, assist in regulating the temperature, and neutralize or destroy bacterial invaders.

100. Nervous system.—The nervous system is made up of the brain, spinal cord, ganglia, and nerves, and is the communication system of the body.

a. The *brain* and *spinal cord* are the most important parts of the nervous system and are known as the central nervous system. The brain lies in the cranial cavity of the skull. Compared with the size of the animal the brain of the horse is relatively small considering the relative brain size of other animals. Relative size of brain to size of body cannot be considered as an absolute indication of the degree of reasoning intelligence; however, there is a distinct correlation. The horse has been considered as occupying about a midway position in the scale of intelligence of the domesticated animals. The *spinal cord* continues from the brain back through the spinal canal of the vertebral column. The central nervous system might be likened to the switchboard of a telephone system, for it is the directing center of the system which receives and dispatches nerve messages.

b. The *ganglia* are secondary nerve centers located chiefly along the spinal cord and might be likened to a subexchange in a telephone system. They receive and dispatch nerve impulses which do not of necessity have to reach the brain. Together with their communicating nerves, they control the involuntary muscles, vital organs, and reflex actions.

c. The *nerves* are bands of white tissue emanating from the central nervous system and ganglia and extending to all parts of the body. In general they follow closely the course of the arteries. There are two kinds of nerves, those that convey sensation to the central system, and those that carry back the command impulses of the central nervous system. The nerves may be compared to the wire lines of the telephone system and the large nerves, like the telephone cable, contain many separate lines.

101. Skin.—*a.* The skin is the covering tissue that acts as a protection to the surface of the body. Wherever the chance of injury is the greatest, the skin is the thickest; in those parts where sensibility is most required, it is the thinnest. The skin of the back, quarters, and limbs are examples of the first type. An especially heavy protective covering is found on the back. In some horses, this covering is as much as one-quarter of an inch in thickness. The face, muzzle, and those parts not exposed to violence, for example,

inside the forearm and thighs, have very thin skin. In spite of this thinness, its strength is remarkable. It is highly sensitive, because it is highly endowed with sensory nerve endings. Accessory organs of feeling are the tactile hairs on the muzzle and the eyelashes. The skin is easily irritated and the horse is endowed with the power of shaking the skin to relieve himself from slight irritations, such as flies. This is accomplished by the aid of the skin muscle (*panniculus carnosus*), which is a thin muscular layer lying directly underneath the skin and attached to it. In health, the skin feels pliable and elastic. The skin of the horse is black except on those parts of the body covered by white hairs where it is white or pinkish in color.

b. The skin is divided into two layers:

(1) The epidermis, or outer portion, is nonvascular and contains the openings for the sweat and sebaceous glands and hair follicles.

(*a*) The sebaceous glands are well distributed over the whole surface of the body and secrete an oily fluid. The oily fluid thus produced serves as a protective secretion against the disintegrating influence of water on the skin; to keep the skin supple; to give gloss to well-groomed skin; to prevent penetration of rain; and to save, to some extent, undue loss of heat.

(*b*) The involuntary muscle fibers are attached to the hair roots which cause the hair to stand up when the horse is cold.

(2) The dermis, or inner portion, is a vascular structure and is closely adherent to the underlying fat and skin muscles. It contains:

(*a*) The nerve endings which give to the skin the sense of touch.

(*b*) The hair follicles which grow the necessary hairs.

(*c*) The sweat glands which discharge sweat directly on the surface of the skin. Sweat is a watery, salty, alkaline fluid of characteristic horse-like odor. It serves to keep the skin moist, remove waste, and help regulate the body temperature by evaporation. It is not found to occur over the general surface of the body in any hairy animal other than the horse. The secretion of sweat is continuous. Certain parts of the skin sweat more readily than others. It begins first at the base of the ears, then the neck; the side of chest and back follow. No sweating takes place on the legs. There are two kinds of sweating, namely, insensible, which evaporates as fast as it is formed, and sensible, which is the visible fluid that collects on the skin when the secretion is rapid. The evaporation of sweat from the surface of the skin is a most important source of loss of body heat. Through sweating there is also a loss of protein substance and of mineral matter. Horses that have sweated freely show this, when dry, by a

grayish covering on the hairs, resembling fine sand. The loss thus produced accounts for the general reduction of vitality in some horses. For this, clipping is the only preventive. Sweating usually results from work or exercise but may appear as a result of nervousness or excitement. After hard work, horses that have been thoroughly groomed and dried sometimes break out in what is known as a second sweat. This usually indicates extreme fatigue or nervousness and that the horse has not been thoroughly cooled out. Patchy sweating, or sweating continuously in a certain localized area, is sometimes observed. The cause is not definitely known.

102. Hair.—Hair covers most of the skin, exceptions being the anal region, genitals, insides of thighs and deep inside of the ear. Even in these regions a few short hairs appear. Hair forms the clothing of the body and its growth is determined by the surrounding temperature. The permanent hair of the body is the hair of the mane and tail, eyelashes, long tactile hairs around the muzzle, and the long hair on the back of the fetlock. The permanent hair is not shed. The general body coat of hair is temporary and is shed twice yearly, spring and fall. The time of shedding is governed by weather conditions or temperature in which the horse is kept. The vitality of the horse seems to be somewhat lowered incident to shedding the coat. This particularly is true during the spring shedding and at this time the skin is much more susceptible to eruptions, irritations, and infections. Mixed sparsely with the general body coat of hair, there will be found a few longer and more rapidly growing hairs that are known as "cat hairs." These hairs are most readily observed when appearing in the growth of the coat following clipping.

103. Parts of foot.—The horse's foot is composed of four parts:

a. The bones.

b. Certain elastic structures of cartilage, or gristle.

c. A layer of highly sensitive flesh or quick, the corium, which covers this bony and elastic framework.

d. The box, or case of horn, called the hoof, which incloses and protects the sensitive parts.

104. Bones of pastern and foot.—The bones of the pastern region and foot form a column extending downward from the fetlock joint into the hoof and are named as follows: the *long pastern bone*, the *short pastern bone*, the *coffin bone*, and the *navicular bone*.

a. The *long pastern bone* extends from the fetlock joint above to the pastern joint below. Its upper end joins, or articulates, with the lower end of the cannon bone, forming the fetlock joint. Its

lower end articulates with the upper end of the short pastern bone, forming the pastern joint.

b. The *short pastern bone* follows the direction of the long pastern bone downward and forward and lies between the pastern and coffin joints, its lower end being within the hoof.

c. The *coffin bone* is of irregular shape, is situated within the hoof, and is similar to the hoof in shape.

(1) The surface of the front and sides is known as the *wall surface.* It has a number of small openings for the passage of blood vessels and nerves and is roughened to give attachment to the sensitive *laminae* which cover it. On each side of this surface is a groove running forward to an opening, through which an artery and a nerve enter the bone and a vein leaves it.

(2) At the top of this surface, in front, is a projection called the *extensor process*, to which is attached the extensor tendon of the foot. On each side of the coffin bone is an extension to the rear called the wing. The lateral cartilages are attached to the outer and upper borders of the wings and the ends of the navicular bone are attached to the inner surface.

(3) The lower surface of the coffin bone, called the *sole surface*, is concave, half-moon shaped and smooth, except at the back part, which is roughened for the attachment of the deep flexor tendon of the foot. It is called the *tendinous surface.* The upper surface, called the *articular surface*, articulates with the short pastern bone and navicular bone and with them forms the coffin joint.

d. The *navicular bone* is of irregular shape. It is situated behind and below the short pastern bone and behind the coffin bone, forming a joint with both. The extremities of the bone are attached to the wings of the coffin bone. The lower surface is covered with cartilage, which forms a smooth surface for the movement of the deep flexor tendon, which bends the joint. Because of its shape the bone is frequently called the shuttle bone.

105. Elastic structures of foot.—All the structures of the foot, except the bones, are more or less elastic or springy, and yield when pressure is applied, but certain parts have a very high degree of elasticity, their special use being to overcome the effects of concussion or jar when the foot strikes the ground, and to prevent injury. These parts are the *lateral cartilages* and the *plantar cushion.*

a. The *lateral cartilages* are two large elastic plates of cartilage, one attached to the top of each wing of the coffin bone. They extend backward and upward so far that their borders may be felt under the skin above the coronet at the heels.

b. The *plantar cushion* is a very elastic wedge-shaped pad, which fills up the space between the lateral cartilages on the sides, the frog below, and the deep flexor tendon of the foot above. The point, or front part, of the plantar cushion extends forward to the ridge, which separates the sole surface from the tendinous surface of the coffin bone, and lies just below the lower end of the deep flexor tendon. The base, or back part, is covered by the skin above the heels. If the frog comes in contact with the ground when the foot is planted, the plantar cushion acts as a buffer and prevents jar.

106. Sensitive structures of foot.—Over the bones and elastic parts of the foot is found a complete covering of very sensitive flesh called the corium. From each part of this layer of flesh some portion of the hoof is secreted or grown. The sensitive parts are the *coronary band*, the *perioplic ring*, the *sensitive laminae*, the *sensitive sole*, and the *sensitive frog*.

a. The *coronary band* is a thick band of tough flesh, nearly an inch wide, extending entirely around the top of the hoof from one bulb to the other, and lying in a groove called the coronary groove on the inner surface of the wall at its upper border. The surface of the coronary band is covered with small hair-like projections, called villi, from which is grown the horny wall of the hoof.

b. The *perioplic ring* is a narrow band of flesh running around just above the coronary band and separated from it by a faint groove in the wall. From the fine villi on the surface of this ring the delicate fibers grow which form the *periople* or varnish-like horn covering of the hoof which assists in the prevention of evaporation of moisture from the wall.

c. The *sensitive laminae*, or fleshy leaves, cover and are firmly attached to the wall surface of the coffin bone and to the lower part of the outer surface of the lateral cartilages. From these delicate leaves of flesh grow the *horny laminae*, or inside lining of the horny wall.

d. The *sensitive sole* covers the sole surface of the coffin bone, is covered with villi, and grows the horny sole.

e. The *sensitive frog* covers the lower surface of the plantar cushion and from its villi the horny frog is secreted.

107. Hoof.—The *hoof* is the outer horny covering of the foot. It is divided into three parts, the *wall*, *sole*, and *frog*. In the healthy foot these parts are firmly united.

a. The *wall*, except the bar, extends from the edge of the hair to the ground and is divided into the *toe*, *quarters*, and *buttress*.

(1) The *toe* is the front part of the wall. It is steeper in the hind foot than in the fore.

(2) The *quarter* extends backward on each side from the toe to the buttress.

(3) The *buttress* is the back part of the heel and may be defined as the angle formed by the union of the wall and bar.

(4) The *bar* is that part of the wall which extends inward and forward from the buttress to within about an inch of the point of the frog. The hoof is thus made stronger by the ends of the wall extending inward to form the bars. The bars are weight carriers, and they also act directly on the wall to produce expansion when weight is placed on the frog.

(5) The outer surface of the wall is covered by a thin varnish-like coat of fine horn, called *periople*. The inner surface is covered with from 500 to 600 *laminae*. These are thin plates of horn running downward and forward. Between them are fissures into which dovetail the sensitive laminae. The horny laminae and the sensitive laminae are firmly united. This union binds the wall of the hoof to the coffin bone and its cartilages, suspends the weight of the horse from the wall as in a sling, and thus prevents the bones from descending on the sole.

(6) On the upper border of the wall is the coronary groove, in which lies the coronary band. The lower border is known as the *bearing surface*. It is the part that comes in contact with the ground in the unshod foot and to which the shoe is fitted in the shod foot.

b. The *horny sole* is a thick plate of horn, somewhat half-moon shaped.

(1) The upper surface is arched upward and is in union with the sensitive sole from which the horny sole grows. The lower surface is hollowed and is covered with scales or crusts of dead horn, which gradually loosen and fall off.

(2) The outer border of the sole is joined to the inner part of the lower border of the wall by a ring of soft horn called the *white line*. This line shows where the nail should be started in shoeing.

(3) The inner border is V-shaped and is in union with the bars, except where the sole joins the point of the frog. The sole protects the sensitive parts above.

c. The *frog* is a wedge-shaped mass filling the V-shaped space between the bars and sole and extending downward more or less below the bars.

(1) The lower surface has two prominent ridges, separated behind by a cavity called the *cleft*, and joining in front at the point

of the frog. These ridges terminate behind in the *bulbs* of the frog. Between the sides of the frog and the bars are two cavities called the *commissures*.

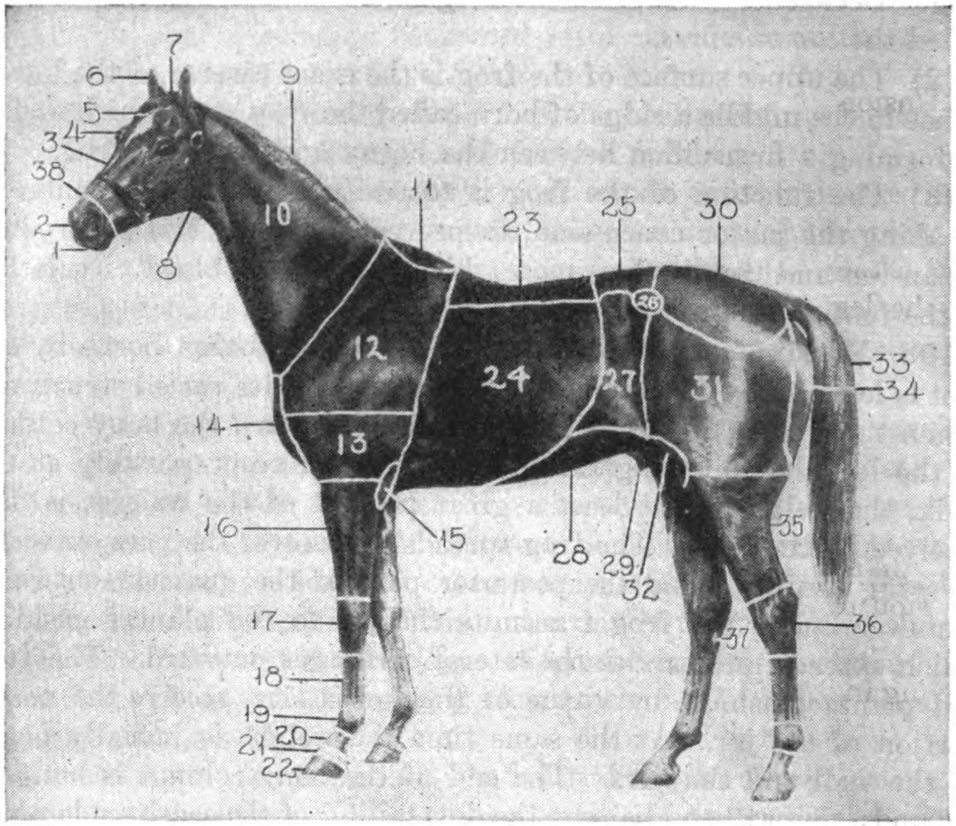
(2) The upper surface of the frog is the exact reverse of the lower. It has in the middle a ridge of horn called the *frog stay*, which assists in forming a firm union between the horny and sensitive frog.

(3) The function of the frog is to assist the plantar cushion in breaking the jar or concussion, to prevent slipping, and to produce expansion and contraction upon which the normal blood circulation in the foot depends.

108. Dissipation of concussion.—The concussion borne by the foot is lessened by a combination of functions of its varied structures. When the weight of the horse is transmitted down the bony column of the leg, the following things take place: Except possibly at the walk, the weight, or at least a great portion of the weight, is first received by the frog. The frog spreads and moves the bars outward, carrying the heels and the posterior part of the quarters outward. Simultaneously, the frog transmits the jar to the plantar cushion, which spreads and carries the lateral cartilages outward. The frog and plantar cushion, by virtue of their elasticity, receive the major portion of the jar. At the same time the weight is initially borne by the wall and the bars. The end of the bony column is hung in a sling in the wall and bars by the dovetailing of the sensitive laminae into the horny laminae. As the weight comes downward, these leaves give way slightly and allow the coffin bone to approach the ground; this in turn causes the sole to be somewhat lowered. The arrangement of the deep flexor tendon over to the navicular bone affords a means by which a portion of the shock is absorbed. The spreading movement of the elastic structures is known as *expansion*. When the weight is removed, these structures return to their normal positions. This is known as *contraction*.

109. Blood supply.—The sensitive structures, especially the corium, are highly vascular and filled with a network of veins. The arterial circulation is sufficient unto itself, but the venous circulation receives a mechanical aid from the movements of the foot. When contraction takes place, the plexuses fill with blood; later, during expansion, the blood is forced out of the veins. These movements of the foot materially aid in the circulation.

110. Moisture.—The horn is made up of a network of tubules that are cemented together. The moisture is contained primarily in these tubules. It is derived internally from the blood supply and externally from moist standings and the soil. The natural hard-



1. Lips, upper and lower.
2. Nostril.
3. Face. From muzzle to a line connecting inner corners of eyes. Bounded on sides by lines from outer corners of eyes to corresponding nostril.
4. Eye. Includes eyelids.
5. Forehead. From upper border of face to poll. Bounded on sides by line from outer corner of eye to base of ear.
6. Ears.
7. Poll. Prominence between the ears.
8. Throat.
9. Crest. Upper border of neck bearing the name.
10. Neck.
11. Withers.
12. Shoulder.
13. Arm.
14. Breast. A single region bounded by the neck, region of the arm, and below by horizontal line at level of elbow joint.
15. Elbow. Corresponds to ulna.
16. Forearm.
17. Knee. Corresponds to knee joint.
18. Cannon.
19. Fetlock or fetlock joint.
20. Pastern.
21. Coronet. Corresponds to coronary band.
22. Hoof.
23. Back.
24. Costal region.
25. Loin.
26. Point of hip.
27. Flank.
28. Abdomen or belly.
29. Sheath.
30. Croup.
31. Thigh.
32. Stifle. Corresponds to stifle joint.
33. Tail.
34. Buttocks.
35. Leg.
36. Hock.
37. Chestnut. (Also on foreleg above knee.)
38. Muzzle. Includes lips, nostrils, and nose, or space between the nostrils.

FIGURE 13.—External regions of horse.

ness of the horn and the periople on the wall serve to prevent undue evaporation. The wall is about one-fourth water, the sole one-third, and the frog one-half water.

111. **External regions of horse.**—In order to insure a uniformity of phraseology for various official papers, and for other purposes of description, a standard nomenclature of the external regions of the horse has been developed which is generally used by horsemen throughout the world. These regions are shown in figure 13. (For a more complete description see AR 40-2250.)

CHAPTER 3

MINOR SURGERY AND MEDICAL AID

SECTION I

OPERATING ROOM AND SURGICAL TECHNIQUE

112. Operating room.—*a.* By operating room is usually meant not only the room or rooms where operations are actually performed, but all the other rooms connected and associated with them, all of which constitute the operating suite. This section of a hospital is a most important place, and upon its equipment and care depends to a considerable extent the success or failure of an operation. Surgeons may, however, be required by necessity to perform operations under conditions far from satisfactory in combat. However, whenever possible, operations of a major character should be performed in hospitals where the patient can be safeguarded by all possible aseptic conditions.

b. The administration of the operating room is one of the duties of the chief of the surgical service. He issues the necessary instructions to nurses and attendants regarding procedures and technique.

c. The operating suite of a modern hospital should be in a location as free from miscellaneous hospital traffic and noises as possible. It consists of the operating room or rooms and various accessory compartments arranged in a convenient order. There are usually at least two operating rooms so that one is always ready for use while the other is being cleaned or repaired, the main room being used for clean surgery and the other one for the dirty or pus cases. In an emergency both may be used simultaneously.

d. The actual size of an operating room should be determined by the number and character of operations to be performed and the space available; it should be large enough to prevent crowding, yet not so large that it is difficult to clean, ventilate, or heat.

113. Lighting.—When natural light is used, a northern exposure is preferable because there is less variation in the intensity of the light from that direction. However, if large north windows are used in a cold climate, one must consider the danger of placing the operating table too close to the window. Little dependence is now placed on natural light, since artificial light is much more dependable and easily controlled. Overhead adjustable top lights are now made with the rays focused from a number of reflectors to reduce shadows on the field of operation to a minimum. These are even more effective when the new spot-beam portable light is used in conjunction with them. Emergency lights are also available to work with batteries should the electric current fail.

114. Heating and ventilation.—The temperature of the operating room is kept at about 80° F. during operations and the ventilating system should be capable of maintaining this temperature during the coldest weather likely to occur in the locality. Many of the modern hospitals are equipped with an air-conditioning unit. Direct or natural ventilation is used chiefly in small hospitals, and must be as nearly perfect as possible. Fresh, clean, warm, moist air should be constantly provided and drafts avoided.

115. Equipment.—*a*. An operating table with all accessories, adjustable as to height and the various standard positions, is desirable, but this type of table is expensive, and quite as good work may be performed on one of a simple design, provided proper forethought is given the type of operation and the required position of the patient. On the table there should be a soft pad about 1½ inches thick covered with rubber sheeting and over all a linen sheet. In addition to the operating table but few pieces are necessary. There should be two or three tables with glass or polished metal tops, preferably metal, for surgical dressings and instruments to be used during the

operation; one single and one double hand basin stand; an irrigating stand; two enamel buckets and a set of glass shelves for solutions, ligatures, drains, pins, etc. All the operating room equipment should be of simple, sturdy, easily cleaned design and should be painted with a durable white enamel.

b. Each table in the operating room holds certain specified articles placed in a definite way so that no time is lost in hunting for the desired article.

(1) On the large table are kept special instruments, reserve instruments, reserve sutures, and linen. At the far end is laid out the preparation equipment for sterilization of the operative field.

(2) There is a basin stand near the foot of the operating table within easy reach of the instrument nurse containing sterile water for dipping the suture materials or for soaking tape sponges.

(3) The instrument tray or table which extends over the operating table holds instruments arranged in regular order. This table routinely holds knives, various scissors, plain and toothed thumb forceps, curved and straight hemostats, Allis forceps, Kocher forceps, gauze sponges, stick sponges, various retractors, probes, and grooved directors.

(4) A stand with a hand basin for sterile water is behind the surgeon for rinsing his gloves during the operation if necessary.

(5) Conveniently located, either in the scrub room or in the operating room near the entrance from the scrub room, are placed basins for solutions to sterilize the previously scrubbed hands of the surgeon and assistants.

(6) A table is provided near the entrance from the scrub room to hold sterile gloves and gowns.

(7) The anesthetist's table for general anesthesia, in addition to the articles necessary for the administration of the anesthetic and an extra supply of the anesthetic, should have the following equipment on it and immediately available for use in an emergency:

(*a*) Wooden mouth gag.

(*b*) Tongue forceps.

(*c*) A curved needle threaded with silk, sterilized, and in a sterile package.

(*d*) Sterile hypodermic syringes with the following drugs in sterile solution in appropriate containers:

Caffeine sodium benzoate.
Atropine sulfate.
Epinephrine hydrochloride (adrenalin).

(*e*) Tracheotomy set.

(*f*) Gauze strips.
(*g*) Forceps (to hold gauze sponge).
(*h*) Watch or small clock.
(*i*) Pus basin.
(*j*) Blood-pressure apparatus.
(*k*) Stethoscope.
(*l*) Anesthetist's chart.

This equipment should be within easy reach and it should be unnecessary to ask for any of these important articles during anesthesia, as delay in meeting an emergency may result in disaster. Some cases require washing out of stomach during or upon completion of operation. It is essential, therefore, that a stomach tube and Levine tube be available in the operating room.

116. Cleanliness.—The walls and floor of the operating room are usually built of waterproof material with a smooth surface and so constructed that sharp, dirt-collecting angles are avoided. The floor should be washed daily with soap and warm water and all surfaces that might collect dust wiped with a damp cloth, the glass-topped tables, that are usually draped sterile, being wiped with a cloth dampened with alcohol. Once a week the walls are thoroughly scrubbed with soap and water, special care being taken to scrub and clean all corners and crevices. Blood or other stains that may get on the floor during an operation should be removed as quickly as possible, and, if a second operation is to be performed immediately, the floor, if necessary, should be cleansed by hand.

117. Adjoining rooms.—The rooms, other than those used for operating, that comprise the operating suite are usually the anesthetizing room, the wash or scrub-up room, the sterilizing room, the instrument room, the surgical dressings room, the storeroom, and the utility room.

a. The anesthetizing room is suitably equipped for the administration of anesthetics.

b. In the wash or scrub-up room there should be at least two lavatories, with foot or knee control for the hot and cold water, a shower bath and toilet, and clothes lockers for the use of the surgeon and his assistants when they change into operating suits. It is well also to have in this room a basin stand for the solutions used to disinfect the hands after the preliminary scrubbing, in order that the surgeon and his assistants can receive their operating gowns and proceed without delay.

c. The sterilizing room is provided with all equipment necessary to sterilize properly instruments, utensils, dressings, water, etc. De-

spite the fact that this equipment is sturdily constructed, constant care must be taken that it is always in working condition and the printed directions furnished by the manufacturers exactly observed. Operation of this equipment will not be intrusted to an inexperienced or careless person, thereby endangering the lives of patients.

d. An instrument room, while not a necessity, is advantageous. However, as a rule, unless the clinic is large, suitably designed glass cabinets placed in the surgical-dressings room will suffice.

e. The surgical-dressings room should be constructed similarly to the operating room. In this room are made, prepared, and stored, after sterilization, the various surgical dressings and packages of linen, such as gowns, sheets, towels, etc., used in operations. Here cleanliness is of paramount importance. Ample locker and shelf space should be provided, and also a large smooth-topped work table.

f. There should be a storeroom solely for the storage of operating room supplies. Much valuable time may be lost unless such a room is provided and kept fully stocked for emergencies.

g. The utility room, in which all cleaning equipment used in the operating suite is stored, should have in it a large, deep sink with running hot and cold water, in which the linen used during operations may be soaked and the greater part of blood stains removed before sending to the laundry. The utility room is an integral part of the operating room equipment, and as such must be scrupulously cared for.

118. Surgical technique.—*a.* Before an operation, it is necessary to make sterile and to keep sterile the patient's skin, the hands and clothing of the surgeon and his assistants, and all instruments and materials that come in contact with the wound or are handled by the surgeon and his assistants.

b. During the operation the surgeon and his assistants must not touch anything that is not sterile. A great responsibility rests upon the operating room personnel, because the most perfect surgery may be a complete failure if there is the smallest break in the aseptic technique for which they are responsible.

c. By aseptic surgery is meant that mode of surgical practice in which everything used at the time of operation and at subsequent dressings, as well as the wound, is free from pathogenic bacteria and is sterile, or surgically clean. To maintain that condition requires constant vigilance before, during, and after an operation, and no failure of technique, however trivial, must be allowed to pass uncorrected.

d. Infection is the word used to describe the condition which exists when infectious organisms gain access to the tissues of the body in such numbers that their presence is manifested by characteristic symptoms, such as inflammation, suppuration, putrefaction, etc.

e. Inflammation is the first objective or outward symptom of infection and is characterized by local pain, heat, redness, swelling, and disordered function. The general or subjective symptoms of inflammation vary greatly, depending upon the amount and location of the tissues involved, the physical condition of the patient, and the disease-producing power of the infecting organism. Fever is the most constant subjective symptom of inflammation, but it may be so slight that it escapes notice or it may be so severe that recovery of the patient seems doubtful. Aseptic treatment and careful observation of wounds is imperative, in order to prevent infection, and if infection does occur it may be recognized promptly and appropriately treated.

f. Suppuration is the result of inflammation and is due to the liquefying action of pyogenic (pus-producing) organisms on the exudates of tissues damaged by inflammation and also upon the tissues themselves, forming pus.

g. When a wound has become so infected that the inflammation does not subside and pus forms, it is termed a "septic" wound. Frequently, as a result of the passage of bacteria from a septic wound into the blood stream or of the absorption of the toxins (poisons) elaborated by the bacteria, grave general symptoms are caused and sepsis or septicemia (blood poisoning) is said to be present.

h. The word putrefaction refers to that condition when inflammation has so far progressed that the tissues have been devitalized and a foul or putrid odor arises from the wound. The putrid odor is due to the action of putrefactive bacteria.

i. The micro-organisms producing pus are know as pyogenic bacteria. The various varieties of the staphylococcus and streptococcus are the causative agents in the majority of surgical infections. Other organisms are, however, occasionally demonstrable. The staphylococcus is the most common cause of infection. It rarely causes alarming constitutional symptoms, and as a rule such an infectious process remains quite localized. The streptococcus is more virulent and tends to invade the whole system. Infection of wounds by one type of organism is quite rare; two or more varieties usually are present and the coincident symptoms are dependent upon the predominating bacterium, either because of its virulence or numbers.

It is well to note that the encapsulated spores of the Bacillus anthracis are the most difficult of all germs to kill, and any process which will render them harmless (and they must be dead to be harmless) may be relied upon to accomplish the same result as regards the other bacteria. The prevention of infection is the best treatment known for this condition. Infection is prevented through the employment of measures that destroy infectious bacteria and their spores, or inhibits or stops their growth. These measures make up that process in surgical technique known as sterilization.

j. Sterilization is the process of rendering anything sterile by destroying infectious organisms and their spores, and is accomplished by mechanical, thermal, and chemical methods. Sterilizing agents are substances which destroy or remove or prevent the growth of infectious organisms.

(1) The methods used in mechanical sterilization, while not dependable, are important preliminary steps to more complete methods of sterilization. The most important of the mechanical methods of sterilization are scrubbing and irrigation.

(*a*) A thorough scrubbing with hot water, soap, and brush is frequently of great importance, as it removes dirt which may harbor harmful bacteria from the walls and floors of operating and treatment rooms, from instruments and utensils, the hands of the surgeon and those assisting at operations and dressings, and the skin of the patient. Instruments and utensils should always be cleaned and scrubbed immediately after use, as that removes most of any bacteria present and makes subsequent sterilization more easily effective.

(*b*) The irrigation of wounds with sterile water or other aqueous solutions to float off or dislodge by force dirt and bacteria, or to bring solutions in contact with parts of a wound which are not otherwise accessible, has a distinct place in surgical practice. Irrigation is a splendid mechanical cleanser and, in many cases, will remove infectious organisms when other methods fail.

(2) Thermal sterilization, or sterilization by heat is the most efficient agent of sterilization, and, when properly used, is almost certain in its germicidal action. Moist heat is used as a sterilizing agent in two forms—boiling water, and live steam under normal and increased pressure.

(*a*) Boiling water is the simplest method of sterilization, and is used chiefly for sterilizing instruments (except those with lenses), metal utensils, enamelware, and other objects which are not injured by heat and moisture. These articles should be boiled for 20 minutes in water containing about 1 percent (3 teaspoonfuls to the quart)

of sodium carbonate, which is added to prevent rusting, to raise the boiling point of the water, and to dissolve any organic matter that may be present. In emergencies surgical dressings may be boiled, but it is far more satisfactory to have them dry at the time of operation. Glassware is boiled 20 minutes in water without sodium carbonate.

(*b*) Live steam is air-free steam and for sterilization purposes is used under normal or increased pressure. Steam under increased pressure is termed superheated steam and is the best method of sterilization. Steam at normal pressure is but little used at the present time.

(*c*) An autoclave is a sterilizer in which steam under pressure (superheated steam) is used. A vacuum first is created to insure penetration of the steam, and when the proper reading of negative pressure (vacuum) is registered in the gage, superheated steam is admitted to the chamber and the articles therein subjected to a steam pressure of 20 pounds for three-quarters of an hour. At the end of this time all organisms will have been killed and the dressings or other articles rendered safe to use, but they are wet. A second vacuum then is induced and maintained until they are dry. One such sterilization ordinarily is sufficient to preclude the possibility of infection, but if there exists the slightest doubt as to the asepsis of the sterilized material the process may be repeated two or three times, despite the fact that anthrax spores are killed by live steam in 12 minutes. This method of repeated sterilization, either by steam or boiling, is termed fractional sterilization.

(*d*) The method of sterilization in which dry heat is used includes the use of the actual cautery, a flame, or hot air. Hot air is fairly satisfactory and it will kill anthrax spores in about 3 hours at 140° C. The cautery is a positive germicide, but causes extensive destruction of the tissues. Sterilization by a flame is rarely, if ever, used in surgery, but may be used for rapid sterilization of platinum loops, needles, and other small instruments.

(3) Chemical sterilization will kill bacteria and spores, but in order to do this promptly they must be used in such strong solutions that the tissues to which they are applied may likewise be destroyed. Such a result is usually undesirable and the use of chemicals as sterilizing agents is confined chiefly to the sterilization of instruments which boiling or steam would ruin, or in weak solution as an adjunct to the mechanical method of sterilization. Chemical solutions of appropriate strength are used in the sterilization of instruments, materials, and utensils, the skin of the patient, the oper-

ator's hands, and the walls and floors of rooms. When used in contact with the tissues the aid is to secure complete sterilization without causing damage to the tissues, but no such ideal aniseptic has yet been found. The following are some chemicals used in sterilization:

(*a*) Alcohol, 70 percent, is commonly used to disinfect the hands of operators, for disinfecting cutting and sharp instruments, for cleansing and drying the skin of the operating field before the application of iodine, and as a solvent or diluent for various antiseptics.

(*b*) Iodine, in strengths varying from 3½ to 7 percent, is a reliable germicide and is used for sterilizing wounds and in preparation of the skin. In the presence of water the iodine is precipitated and it will not penetrate if the skin or tissues are wet. When used for skin sterilization it is usually preceded by an application of benzine or ether to remove the sebaceous matter and dry the skin. After the iodine has dried it is customary to remove the excess with alcohol to prevent the burning or blistering of the skin.

(*c*) Bichloride of mercury is now seldom used in contact with the body although some operators use it in preparation of their hands. In weak solutions it has a powerful germicidal action on superficial bacteria, but is of little value as a germicide in deep wounds because it combines with the proteins in the tissues to form an insoluble albuminate of mercury which markedly hinders its action and penetrative power. A 1–500 solution in alcohol is useful in sterilizing rubber goods. As mercury has corrosive action on metals it should never be used to sterilize instruments.

(*d*) Phenol (carbolic acid) in saturated solution is used for sterilization of cutting instruments which would be injured by boiling. They are submerged in the solution for 15 minutes, washed in sterile water, and placed in alcohol until needed. It is also used for sterilization of tissues, such as the stump of the appendix, where deep penetration is not required, and as a local cauterizing agent. Phenol dressings should not be used because of the danger of subsequent gangrene.

(*e*) Dakin's solution is a solution of sodium hypochlorite of strength between 0.45 and 0.5 percent. In contact with the tissues it gives off nascent chlorine, which destroys bacteria and dissolves the necrotic tissue in which they grow. It is rapidly decomposed by light and heat and should be titrated daily to insure the proper strength. When used according to the Carrel technique in a properly prepared wound, it is of great value.

(*f*) The chloramine group of disinfectants also act by liberation of chlorine. They are more stable than Dakin's solution and give off their chlorine more slowly, but they lack the important solvent action on the necrotic tissue.

(*g*) Potassium permanganate is an excellent deodorizer and, in addition, is a good disinfectant for the hands in saturated solution.

(*h*) Boric acid is a very mild antiseptic and generally is used in saturated solution (4 percent) for the irrigation of infected wounds or the sterilization of instruments which heat in any form would destroy.

(*i*) Formaldehyde is a germicide and is used as a gas or in solution. It is very irritating to the tissues and seldom is applied in a dressing; in weak solution (4 percent) it is a satisfactory sterilizing solution for instruments. Formaldehyde solution is a satisfactory method of sterilizing instruments which heat would injure, as catheters, cystoscopes, and similar articles. Mercury oxycyanide solution 1–1,000 is also used for catheters, cystoscopes, etc.

(*j*) Various substances that color or dye the skin, such as picric acid, mercurochrome, gentian violate, merthiolate, and acriflavine are also used as disinfectants.

k. The sterilization of equipment is accomplished as follows:

(1) Large packs are sterilized for 60 minutes under 20 pounds pressure with 20 to 30 minutes vacuum allowed for drying. Small packs are sterilized for 30 minutes under 20 pounds pressure with 15 to 20 minutes vacuum allowed for drying. Enamelware and glassware are sterilized for 20 minutes under 30 pounds pressure with no vacuum. Rubber goods are sterilized for 15 minutes at 20 pounds pressure and 15 minutes vacuum. Solutions in flasks are sterilized separately for 15 minutes at 20 pounds pressure. Pressure, at conclusion of sterilization period, is allowed to decrease gradually. No vacuum is used on solutions. Sharp instruments are sterilized in cresol 1 hour and boiled for 1 minute. Sharp instruments can be sterilized by placing in cresol for 30 minutes, rinsed in plain sterile water, and placed in 70 percent alcohol for 30 minutes. Other instruments are placed in trays and boiled for 20 minutes. A 1-percent solution of sodium carbonate (3 teaspoonfuls to the quart) raises the boiling point about 5°, prevents rust, and removes grease and other organic matter. Gloves are cleaned, inspected for holes, dried, then powdered well and evenly on both sides with talc. The cuffs are turned back 2 inches. Each pair is placed in a muslin envelope of 4 thicknesses with a small powder bag. This is wrapped

in a muslin cover and sterilized for 15 minutes under 20 pounds pressure.

(2) Both chemical and bacteriological controls are used to insure proper sterilization, and laboratory cultures of all packages are frequently taken.

(3) Basins are boiled in a special sterilizer for 30 minutes.

(4) The suture materials which are dispensed in tubes have been rendered sterile by the manufacturer. The tubes themselves are sterilized in two ways. If the tubes are marked "boilable" they are sterilized by boiling with instruments for 20 minutes. If they are not marked "boilable", they are stored in 5 percent phenol or cresol solution and then placed in 70 percent alcohol for 20 minutes just prior to operation.

(5) Suture materials such as silk and linen not dispensed in tubes are sterilized in the autoclave under 20 pounds pressure for 15 minutes or boiled with instruments. Horsehair, silkworm gut, silver wire, etc., are sterilized by boiling for 20 minutes prior to operation.

119. Surgical dressings.—*a.* Surgical dressings commonly are made from gauze, cotton, flannel, rubber, linen, etc., by the operating room force. The gauze and cotton should be of good quality and capable of rapidly absorbing fluids.

b. It sometimes happens that the gauze, as received from the manufacturers, is sized (coated with a starch preparation which makes it unfit for surgical use) and such gauze must be boiled in a 1 percent solution of sodium carbonate in order to remove the sizing.

c. Sponges are used for many purposes and are made of gauze, either rolled in a ball or flat. The flat sponges are of various sizes, 2 by 2, 4 by 4, and 4 by 8 inches, and are usually of from 6 to 8 thicknesses of gauze. All raw edges are turned in. Sponges are wrapped in double muslin wrappers for sterilization.

d. Packs, or taped sponges, are used for surrounding the field within the abdomen. They are made of 6 or 8 layers of gauze, with all the raw edges turned in and sewed. To avoid leaving them in the abdomen, a tape is sewed to one corner, and to this a metal ring is secured. The common sizes of packs are 4 by 18, 8 by 18, and 12 by 12 inches. For sterilization they are placed in double muslin covers, each package containing a definite number and so labeled. During the operation the nurse or attendant in charge of them must know the exact location at all times of every pack that has been issued.

e. Pads are 8 by 10 and 12 by 16 inches and are of absorbent cotton wrapped in an outer covering of gauze. They are used in wound dressings for absorbing fluids and to protect the tissues from pressure.

f. Sheets and towels are folded in a certain manner and wrapped, a definite number in each package, in double muslin covers for sterilization.

g. Caps and masks are worn to prevent infection by dandruff or secretions from the mouth and nose. They are inclosed in muslin wrappers, sterilized, and placed in the surgeon's dressing room.

h. Operating suits are worn in place of their outer clothing by surgeons and attendants during operations. They may be used as they come from the laundry.

i. Operating gowns are of standard type in the Army and are worn by all persons present at an operation. When putting on a sterile gown one should avoid touching the ungloved hand to its outside.

j. In preparation for emergencies a hospital should have on hand a considerable quantity of sterile goods. They may be placed in metal drums or in packages, each containing a standard outfit for an operation. These should be sterilized once a week if not used.

120. Sutures and ligatures.—*a.* There are two principal kinds of sutures and ligatures, absorbable and nonabsorbable. The principal varieties of absorbable sutures are plain gut, chromic gut, and kangaroo tendon. Gut sutures are made from the submucous coat of the intestine of the sheep; they are used in the deep tissues such as peritoneum, muscle, and fascia. The plain gut is supposed to last from 8 to 10 days in the tissue. Chromic gut sutures are prepared to last 10 and 20 days in the tissue, but the rate of absorption is variable. Sutures come in various sizes from 000 to 3. They are usually issued in plain glass tubes which may be sterilized by boiling or submerging in a special suture sterilizing solution such as potassium-mercuric-iodide solution 1–8,000 in 95 percent alcohol. Kangaroo tendon is much stronger and heavier than the gut and lasts about 30 days in the tissue.

b. The atraumatic intestinal suture is attached to the needle in such a manner that the perforation made by the needle is not enlarged or traumatized by the entrance of the suture itself. These sutures are made in both plain and chromic from size 0000 to 2 and may be used for all membranes where minimized suture trauma is desirable.

c. Nonabsorbable sutures are made of silk, linen, silkworm gut, horsehair, dermol, silver wire, and other materials.

121. Instruments.—*a.* Most surgical instruments are made of special steel, and are nickel-plated or of stainless steel. They are kept in a special cabinet when not in use.

b. After an operation all metal instruments should be washed carefully in cold water with a brush to remove all blood and other foreign matter, then boiled. They should be then dried and carefully examined for dirt in the crevices and breaks in the plating and sharpened if necessary. They are then wiped with warm liquid petrolatum or typewriter oil to prevent rusting and placed in the instrument cabinet.

c. The instruments required for an operation vary greatly according to the nature of the operation and the ideas of the surgeon. The following is suggested as a basic outfit for ordinary operations (others may be added as desired): 2 scalpels; 3 scissors (1 curved Mayo, 1 straight Mayo, and 1 blunt for suture scissors); 2 plain thumb forceps; 2 rat-toothed thumb forceps; 12 small (Kelly Rankin) straight hemostats; 12 curved Kelly hemostats; 8 Allis intestinal forceps; 12 Ochsner straight forceps, 6½-inch; 6 large Ochsner straight forceps, 7¼-inch; 6 mosquito forceps; 12 towel clips; 2 large retractors; 2 Army type retractors; 1 grooved director; 1 silver probe; 12 sponge holders; 3 curved hysterectomy forceps; 3 needle holders; needle kit containing all types of needles (straight intestinal, straight skin, curved cutting, curved intestinal, Mayo needles); plain and chromic gut; assorted glass syringes and hypodermic needles; 3 medicine glasses; skin clips and forceps or dermol for the skin; 12 laparotomy rings; and 2 tumblers.

122. Operating personnel.—*a.* In the Army this consists of the operating surgeon and the medical officers who assist him, the operating room nurse, the anesthetist, and two or more enlisted men.

b. The operating surgeon is in general charge. He is responsible for the patient's life and for the successful outcome of the operation. He is held accountable for all mistakes and accidents, no matter whose fault it may be, that may cause an unfavorable outcome.

c. To the operating room nurse is delegated the authority necessary for the routine administration of the operating suite. This involves numerous details such as the care and accounting for all property, cleanliness, sterilization, preparation for operations, and supervision and instruction of enlisted men.

d. (1) The anesthetist is usually a nurse who has had special training in this branch. She is responsible to the operating surgeon for the general condition of the patient during the administration of an anesthetic.

(2) Since local and spinal anesthesia have become so popular, many surgeons prefer to be their own anesthetists. The operating room nurse, in case no regular anesthetist is assigned, sits at the patient's head during the operation and keeps a record at frequent intervals of the blood pressure, pulse, and respirations.

e. The enlisted men are detailed to the operating room for the purpose of instruction and training. The principal characteristics of a good operating room attendant are dependability, faithfulness in the most minute details of his work, an even temper which will enable him to work quickly and accurately in emergencies, intelligence to understand the reason for everything he does, and a devotion to the welfare of the patient.

123. Preparation for operation.—*a*. Each one of the operating room personnel removes his outer clothes, puts on his operating clothes, and then proceeds to the scrub-up room. Here the hands and forearms are scrubbed for 15 minutes with hot water and green soap and rinsed and soaked in 70 percent alcohol. This washing should be done in a methodical way so that each side of the fingers and every part of the hands and forearms are scrubbed thoroughly. It is essential that persons engaged in surgical work keep their nails short and clean. After scrubbing and rinsing in alcohol, the surgeon enters the operating room where he is handed a hand towel with which he dries only his hands, leaving his forearms untouched by the towel. He then puts on a sterile gown and sterile rubber gloves. When fully prepared as above, and while waiting for the start of the operation, the surgeon and his assistants must hold their hands, covered with a sterile towel, above their waist.

b. The field of operation is shaved before the patient enters the operation room, although sometimes this is done in the operating room. If a general or spinal anesthetic is used, the skin preparation is done after the patient is anesthetized. With local or block anesthesia, the field is prepared before the injection of the anesthetic is given.

c. If a spinal anesthetic is used, special material and apparatus are necessary which should be laid out on a table. The spinal kit consists of the following articles: one 5-cc. hypodermic syringe; one 2-cc. hypodermic syringe; two spinal needles; one hypodermic needle; one mixing needle; one ampule saw; one sacral sheet; sponges, etc.; 100, 120, 150 milligrams of novocaine crystals or other drug as desired by the operating surgeon. After the spinal injection the table is tilted according to instructions from the anesthetist.

d. There are many ways of preparing the skin. A simple and very satisfactory one is to scrub the skin with a gauze "prep" sponge wet with ether to remove grease and moisture, and then paint the skin thoroughly with 3.5 percent iodine and allow to dry. After the iodine is completely dry paint the skin with a second coat, beginning in the middle of the field and progressing outward to the edges of the previous coat and remove with alcohol on sponges. Drape with sterile towels and sheets, so that only the prepared skin is exposed. Other common disinfectants used in the Army for skin preparation are merthiolate, mercurochrome, Scott's solution, etc.

e. Following is a summary of the routine preparations for an operation:

(1) The operating room nurse, the anesthetist, and the surgeon are notified as to the time and nature of the operation.

(2) The attendant in charge of the instruments selects those needed and puts them in the sterilizer with the necessary utensils.

(3) The cutting instruments are placed in a sterilizing solution.

(4) All hands assist in placing the furniture and equipment in proper order, and all glass-topped tables, Mayo tables, overhead lights, and portable lights are wiped with a towel wet with alcohol.

(5) The attendant in charge of sterile supplies selects the packages of sterile goods and places them on the proper tables.

(6) The nurses or attendants proceed to scrub up and put on sterile gowns and gloves.

(7) Nurses or attendants drape, with sterile sheets, the table for gowns and gloves, the instrument table, the surgical dressing table, the basin stands, and spinal anesthetic table.

(8) The trays of sterile instruments are brought in from the sterilizer and are arranged in proper order on the instrument table and draped with a sterile towel until needed.

(9) The basin and utensil set is opened and the contents placed in their proper places.

(10) The sterile packages are opened and an attendant places their contents in the proper place on the surgical dressing table.

(11) Nurse or attendant sorts and arranges the extra instruments on a table and prepares the sutures and ligatures. (Sutures are no longer placed in a damp towel, but in a dry one, as it has been discovered that continued soaking causes them to lose their tensile strength and greatly increases the danger of contamination. They are dipped in warm water for a few seconds immediately before handing them to the operator.)

(12) If spinal anesthesia is to be used, the spinal kit is opened.

(13) All tables and stands containing sterile articles are draped with sterile towels or sheets until they are needed.

(14) The patient is wheeled into the operating room.

(15) By this time the surgeons and assistants are dressed and scrubbed and ready to put on sterile gowns and gloves.

(16) The patient's skin is then prepared by the assistant in the manner previously described.

(17) The patient is then draped with towels and laparotomy sheets by the assistant and nurse or attendant.

(18) The instrument table is rolled into place as well as the basin stands.

(19) The surgeon and his assistants assume their proper places.

(20) The nurse or attendant hands the surgeon the scalpel; the incision is made, after which the skin knife is discarded, and the operation proceeds.

SECTION II

BANDAGING AND DRESSING

124. General.—Bandaging is an art which develops only after extensive practice. The coach-and-pupil method is a very good method for beginners. Each pair alternate as the coach and pupil.

125. Uses.—*a.* To retain dressings, in keeping medications to affected parts.

b. To give support to dependent parts of the body as the arms, scrotum, etc.

c. To apply pressure in control of hemorrhage, to assist in absorption of fluids and as tourniquets.

d. To keep foreign matter out of wounds.

e. To absorb wound secretions, as pus, etc.

f. For immobilization in combination with splints.

126. Acknowledgment.—The illustrations and most of the text in this section are taken from the *Handbook of the Hospital Corps, U. S. Navy*, and the courtesy of the Bureau of Medicine and Surgery in permitting the use of that handbook is acknowledged.

127. Rules for bandaging.—*a.* In applying a roller bandage, the roll should be held in the right hand so that the loose end is on

the bottom; the outside surface of the loose or initial end is next applied to and held on the part by the left hand; and the roll is then passed around the part by the right hand which controls the tension and application of the bandage. Two or three of the initial turns of a roller bandage should overlie each other in order to secure the bandage and keep it in place. In applying the turns of the bandage, it is often necessary to transfer the roll from one hand to the other.

b. Bandages should be applied evenly, firmly, and not too tightly. Excessive pressure may cause interference with the circulation and may lead to disastrous consequences. In bandaging an extremity, it is therefore advisable to leave the fingers or toes exposed in order that the circulation of these parts may be readily observed. It is likewise safer to apply a large number of turns of a bandage rather than to depend upon a few too firmly applied turns to secure a splint or dressing.

c. In applying a wet bandage, or one that may become wet in holding a wet dressing in place, it is necessary to allow for shrinkage. The turns of a bandage should completely cover the skin, as any uncovered areas of skin may become pinched between the turns with resulting discomfort.

d. Bandages should be applied in such a manner that skin surfaces are not brought in contact, as perspiration will cause excoriation and maceration of the skin.

e. In bandaging an extremity, it is advisable to include the whole member (arm and hand, leg and foot), except the fingers and toes, in order that uniform pressure may be maintained throughout. It is also desirable in bandaging a limb that the part be placed in the position it will occupy when the dressing is finally completed, as variations in flexion or extension of the part will cause changes in the pressure of certain parts of the bandage.

f. The initial turns of a bandage of an extremity (including spica bandages of the hip and shoulder) always should be applied securely, and when possible, around the part of the limb that has the smallest circumference. Thus in bandaging the arm or hand, the initial turns usually are applied around the wrist, and in bandaging the leg or foot, the initial turns are applied immediately above the ankle.

g. The final turns of a completed bandage usually are secured in the same manner as are the initial turns, by the employment of two or more overlying circular turns. As both edges of the final circular turn are necessarily exposed, they should be folded under to present a neat, cuff-like appearance. The terminal end of the

completed bandage is turned under and secured to the final turns by either a safetypin or adhesive tape. When these are not available, the end of the bandage may be split lengthwise for several inches, and the two resulting tails secured around the part by tying.

h. When the turns of a bandage cross each other, as in the figure-of-eight, the spiral reverse, and the spica, the line of crossing should be straight, and if practicable, should be in the center line of the part bandaged, but the line of crossings should not be over a bony prominence. The exposed portions of the turns should be of approximately the same width.

i. In removing a bandage, it may be cut, preferably with bandage scissors. In doing so the operator should be careful to avoid interference with the underlying dressing and the affected area.

j. If the bandage is removed without cutting, its folds should be gathered up in first one hand and then the other as the bandage is unwound. This procedure will facilitate removal and the rewinding of the bandage, if that be desirable.

128. Application of bandages and their uses.—*a. Circular bandage.*—After anchoring the initial turns of the bandage, a series of circular turns is made around the part. Each turn should overlie accurately the turn beneath it, neither ascending nor descending. This bandage is used for retention of dressings to a limited portion of an extremity, the neck, or the head; compression to control venous hemorrhage and to promote venous stasis.

b. Spiral bandage.—After anchoring the initial turns, each turn is applied in a spiral direction in such a manner as to overlie one-third of the preceding turn. As usually applied to an extremity, the upper edge of each turn of an ascending spiral is tighter than the lower edge with resulting inequality of pressure. For this reason, many surgeons object to its use on an extremity. This bandage is used for retention of dressings of the arm, chest, and abdomen (fig. 14).

c. Oblique bandage.—A series of oblique turns is applied around a part in such manner as to have an uncovered area between turns. The width of the uncovered area should be uniform throughout. This bandage is used for retention of thick dressings or of temporary dressings which require frequent removal.

d. Recurrent bandage.—In applying this bandage, the roller, after securing the primary turns, is carried completely over a part to a point opposite its origin, and then reflected and brought back to the starting point where it is secured by one or more circular turns (fig. 15). In the recurrent bandage of the hand, the bandage is

secured at the wrist, carried over the back of the hand, around the tips of the fingers, across the palm to the wrist. Held at this point by the disengaged hand of the operator, the bandage is carried across the palm around the tips of the fingers, across the back of the hand to the wrist, where it is held by the thumb of the operator's disengaged hand. Each turn overlies one-third of the preceding turn. The original turn over the fingers may cover the middle and ring fingers, with each succeeding turn applied alternately over the other fingers first to one side and then to the other of the middle finger; or the original turn over the fingers may be applied over the first finger

FIGURE 14. — Spiral bandage. (Owen.)

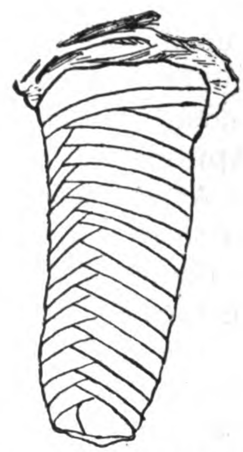


FIGURE 15. — Recurrent bandage of stump. (Wharton.)

or over the little finger, each subsequent turn covering a portion of the remaining exposed fingers. The reflected portion of the bandage at the wrist is then secured by a number of circular turns. It is customary to complete such a bandage with a figure-of-eight bandage enclosing the entire hand.

e. Figure-of-eight bandage.—This is undoubtedly the most useful bandage and, with its various modifications, probably is employed more frequently than any other type. The enlisted man should perfect himself in the application of this bandage, as, with a few exceptions, the majority of bandages are applied on the principle of the figure-of-eight. Its name is derived from the fact that the turns are applied so as to form a figure 8. Although it is employed commonly in bandages of the joints (elbow, knee, and ankle), it frequently is applied

in bandaging the neck and axilla, head and neck, and head and jaw. If properly applied, it may be used very successfully in bandaging the extremities.

(1) *Hand and wrist.*—After anchoring the bandage with two circular turns about the wrist, the bandage is carried across the back of the hand to the base of the fingers, then into the palm, across the palm to the back of the hand, and across the back of the hand to the starting point at the wrist, where one circular turn is made. This general course is followed with several similar turns, each one overlying about one-third of the preceding turn on the back of the hand. After a sufficient number of turns has been made, the bandage is terminated with a circular turn around the wrist. This bandage is used for retention of dressings on the back of the hand or in the palm (fig. 16).

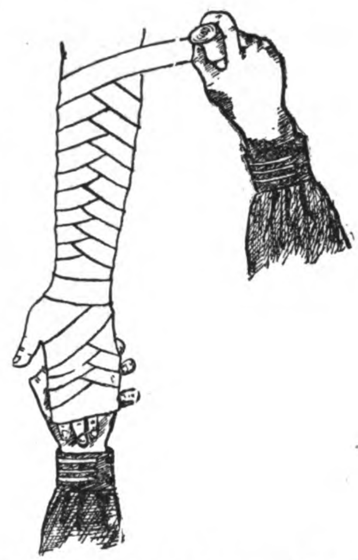


FIGURE 16.—Figure-of-eight bandage. (Wharton, modified.)

(2) *Forearm.*—This bandage may be the continuation of the figure-of-eight of the wrist and hand, or may be started with primary circular turns of the wrist. The bandage is carried obliquely upward across the back of the forearm and around the arm in its natural course, where it forms the upper loop of the figure-of-eight. The bandage then is carried in an oblique direction downward across the back of the arm, where it crosses the upward turn of the bandage. Then it is carried around the lower end of the forearm to complete the lower loop of the figure-of-eight. The same process is repeated several times until the elbow is reached, each turn overlapping the upper one-half or three-quarters of the preceding turn. The bandage is terminated finally with two or more circular turns at the elbow. The final cir-

cular turn, with both upper and lower edges of the bandage folded under, should be applied firmly and should present a neat, cuff-like appearance at the upper end of the completed bandage (fig. 16). During the application of this bandage, there is always considerable slack in one edge of the bandage where it is carried around the arm. As the bandaging proceeds, however, these loose edges are covered by the ascending turns of the bandage. It is used for retention of dressings and covering of splints.

(3) *Elbow.*—With the elbow in the desired position, the initial end is secured by circular turns around the forearm just below the elbow. The bandage then is carried upward over the flexure of the elbow in an oblique direction and passed around the arm just above the elbow, where a circular turn is made, and then is carried obliquely downward across the flexure and passed around the forearm. This procedure is repeated, with each turn overlying the preceding turn, the turns on the forearm ascending and those on the arm descending until the entire joint is covered. The final turn is a circular one around the elbow joint itself. This bandage may be started with a circular turn around the joint followed by figure-of-eight turns covering the upper part of the forearm and the lower part of the arm. It is used for retention of dressings around the elbow joint.

f. Spiral reverse bandage of the arm.—This bandage is in reality a modification of the figure-of-eight, in that only the lower loop or one-half of the figure-of-eight is completed. After anchoring the

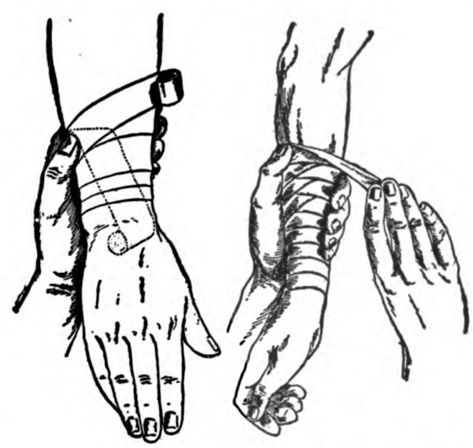


FIGURE 17.—Spiral reverse. (Eliason.)

primary turns, the bandage is carried obliquely upward on the back of the arm. When this turn reaches the center line of the arm, the thumb of the disengaged (usually the left) hand is placed upon the body of the bandage to hold it securely in place upon the arm. The

operator then unrolls about 5 or 6 inches of bandage which is held slack and is folded upon itself by changing the position of the hand holding the roller from supination to pronation. The bandage then is carried obliquely downward across the arm to a point opposite that from which the ascending turn started. It then is tightened slightly to conform to the part accurately, then is carried around the limb and the procedure is repeated. It is necessary to retain the thumb upon the point of reverse until the succeeding turn reaches that point. As in the figure-of-eight, each turn should overlie at least one-third of the preceding turn and the reverses should be in a straight line (fig. 17).

g. Complete bandage of the hand.—After securing the initial turns around the wrist, a recurrent bandage of the hand is applied. The bandage then is carried obliquely across the back of the hand to the tip of the index finger. A circular turn is made around the ends of the fingers. The fingers and hand then are covered by a figure-of-eight or spiral reverse bandage which finally is completed by two or more circular turns around the wrist. This bandage may or may not be applied to include the thumb. It is used for retention of dressings of the hand (fig. 18).

h. Demigauntlet bandage.—Using a 1-inch bandage, secure the initial turns at the wrist and carry the bandage across the back of the hand to the base of the thumb, around the thumb, across the back of

FIGURE 18.—Complete bandage of hand. (Wharton.)

FIGURE 19.—Demigauntlet of hand. (Wharton.)

FIGURE 20.—Gauntlet bandage of hand. (Wharton.)

the hand to the wrist, where a circular turn is made. The same procedure is repeated successively for each finger and the bandage finally terminated with a circular turn around the wrist. It is used for retention of dressings on back of hand (fig. 19).

i. Gauntlet bandage.—The demigauntlet bandage may be extended to include the entire thumb and fingers with either simple spiral turns or spiral reverse turns of each digit (fig. 20).

j. Spica bandage of right shoulder (ascending).—After securing the initial end by two circular turns around the arm opposite the axillary fold, the bandage is carried diagonally across the arm and front of the chest to the axilla of the opposite side, then around the back of the chest, across the arm, and across the upward turn to the point of origin. After carrying the bandage around the arm, this procedure is repeated, each turn overlying about two-thirds of the preceding turn until the entire shoulder is covered. The turn should cross in a straight line extending up the center line of the arm over the point of the shoulder. Likewise the turns across the chest and back should overlap each other uniformly, and the turns in the opposite axilla should overlap each other exactly. The bandage may be secured by either a pin or adhesive tape. It is used for retention of dressings of shoulder and axilla and of shoulder cap (fig. 21).

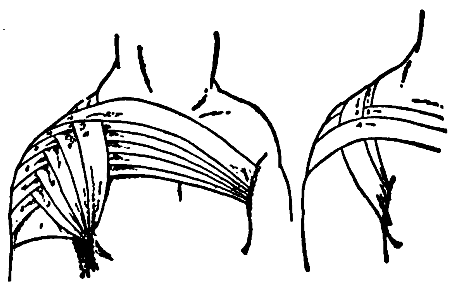


FIGURE 21.—Spica and spica loops of the shoulder. (Eliason.)

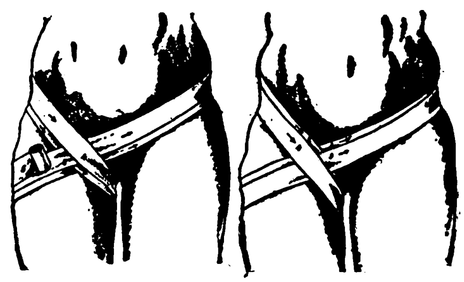


FIGURE 22.—Ascending and descending spica. (Eliason.)

k. Bandages of the lower extremity.—The bandages described in the preceding paragraphs may be applied to the corresponding parts of the lower extremity. However, descriptions of a few of the special bandages of the lower extremity are as follows:

(1) *Spica bandage of the groin (ascending)*.—After securing the initial turns around the upper part of the thigh just below the groin, the bandage is carried obliquely upward across the lower abdomen to the iliam crest of the opposite side, transversely across the back, then downward obliquely across the front of the thigh, across the upward turn of the bandage, and around the thigh to the point of origin, thus completing a figure-of-eight. This is repeated several times until the entire groin is covered, each turn overlying about two-thirds of the preceding turn. The same care in regard to the line of crossings of the turns and to the uniform overlapping of the bandage on the abdomen should be observed as is noted in the description of the spica bandage of the shoulder. It is used for retention of dressings in region of the groin (fig. 22).

(2) *Spica bandage of the foot.*—The initial end is secured by two circular turns around the leg just above the ankle. The bandage then is carried across the dorsum of the foot to the base of the toes where a circular turn is made around the foot. After two or three spiral reverse turns are made, the bandage is carried across the dorsum of the foot, backward alongside of the heel, around the heel, forward along the other side of the heel across the preceding upward turn on the dorsum of the foot, and around the foot to the starting point of the turn. This process is repeated, the turns gradually ascending on both the foot and the heel, the crossings of bandage being in the midline of the dorsum of the foot. The bandage finally is carried upward around the ankle and secured by two or more circular turns at its original starting point. It is possible to apply this bandage without the use of the spiral reverse turns by employing the figure-of-eight throughout. It is used for retention of dressings on the foot and support for sprained ankle (fig. 23).

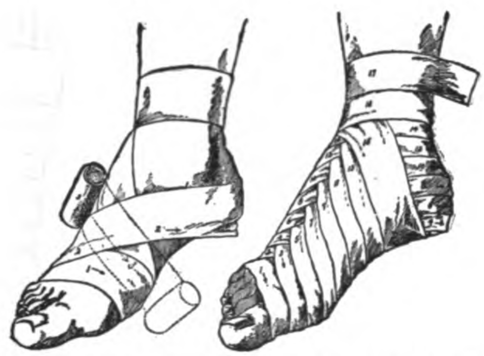


FIGURE 23.—Spica of the foot; first step and completed. (Eliason.)

(3) *Bandage of foot, not covering the heel.*—After securing the initial end by two circular turns around the leg just above the ankle, the bandage is carried obliquely across the dorsum of the foot to the base of the toes where a circular turn is made around the foot. The bandage is carried up the foot by a few spiral reverse turns crossing in the center line, and then applied as a figure-of-eight around the ankle and instep. The bandage may be terminated just above the ankle or be extended up the leg as far as may be necessary. It is frequently practicable to apply this bandage without employing the spiral reverse turns, the figures-of-eight being applied following the circular turns at the base of the toes. It is used for retention of dressings of foot. This bandage usually is employed in application of bandages covering the entire leg.

l. Special bandages.—(1) *Velpeau bandage.*—The fingers of the affected side are placed upon the opposite shoulder, a pad placed in

the axilla, and the skin surfaces separated by sheet wadding. Place the initial end of the bandage on the shoulder blade of the sound side, carry the bandage across the outer portion of the affected shoulder, downward over the outer and posterior surface of the flexed arm, behind the point of the elbow, obliquely across the back of the forearm and chest to the opposite axilla, and around to the point of origin. After repeating this turn once, the bandage is carried from the point of origin across the back and side of chest, in front of the flexed elbow and transversely across the front of the chest. Then it is carried around the other side of the chest, diagonally across the back to the affected shoulder. The first turn then is repeated, followed by a second circular turn around the chest and

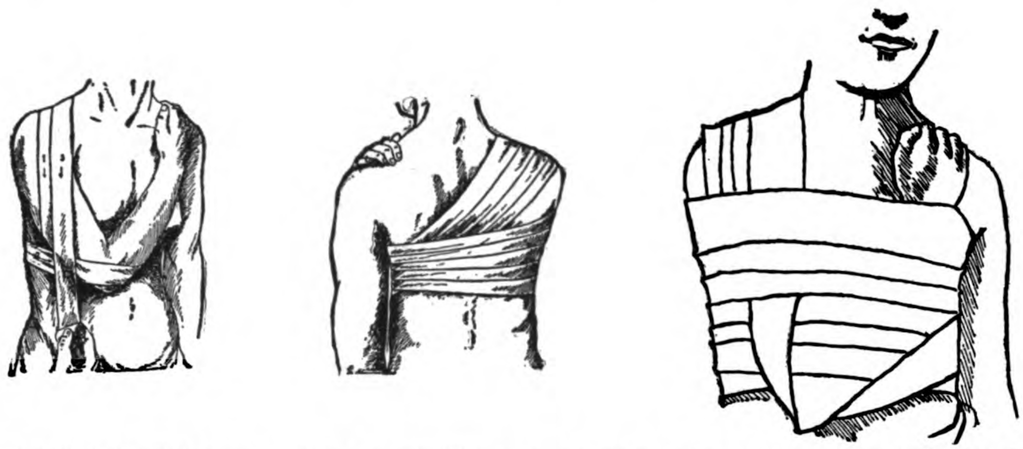


FIGURE 24.—Velpeau bandage; start (Eliason), posterior view (Eliason), and completed (Wharton).

flexed arm. Each vertical turn over the shoulder overlaps two-thirds of the preceding turn, ascending from the outer part of the shoulder to the neck and from the upper posterior surface of the arm inward toward the point of the elbow. Each transverse turn also overlies one-third of the preceding turn. These transverse turns are continued until the last turn covers the wrist. The bandage is finally secured with pins, both where it ends and at various points where the turns of the bandage cross each other. (The initial turns of this bandage may be secured by circular turns around the chest under the arm of the affected side.) It is used for fixation of arm in treatment of fractured clavicle and fixation of humerus after reduction of dislocated shoulder joint (fig. 24).

(2) *Barton bandage.*—With the initial end of the bandage applied to the head just behind the right mastoid process, the bandage is carried under the bony prominence at the back of the head, upward

and forward back of the left ear, obliquely across the top of the head, downward in front of the right ear, under the chin, upward in front of left ear, obliquely across the top of the head, crossing the first turn in the midline of the head, thence backward and downward to the point of origin behind the right mastoid. Then it is carried around the back of the head under the left ear, around the front of the chin, under the right ear to the point of origin. This procedure is repeated several times, each turn exactly overlying the preceding turn. The bandage is secured with a pin or strip of adhesive tape, and either a pin or adhesive may be applied at the crossing on top of the head. It is used for fracture of lower jaw and retention of dressings of chin (fig. 25).

FIGURE 25.—Barton bandage. (Wharton.)

(3) *Recurrent bandage of head*.—The initial turns are applied around the head, passing around the nape of the neck, above each ear and around the forehead. When the bandage has reached the center of the forehead on the third turn, its free margin is held by a finger of the left hand and the bandage is reversed and carried over the top of the head in the center line to the nape of the neck. With an assistant holding the bandage at the latter point, it is reflected forward over the top of the head covering the right half of the preceding turn. When it reaches the forehead in the midline, it again is reflected over the top of the head, overlying the left half of the first turn. At the nape of the neck in the center line, it is again reflected and carried forward overlying the outer half of the second turn. This process is repeated until the entire head is covered, the turns alternating to the right and left of the center line. The bandage finally is completed by several circular turns overlying the original turns and fixing the ends of antero-posterior turns at the nape of the neck and on the forehead, where pins should be applied to provide additional security. Uses: Retention of dressings of wounds of

the scalp, of fractures and operative wounds of the skull (fig. 26). This bandage may be applied with the turns over the head in a transverse direction extending from ear to ear.

(4) *Crossed bandage of one eye.*—The initial extremity is secured by a circular turn around the head below the bony prominence at the back, above both ears and across the forehead. The bandage then is carried from the back of the head, below the ear, obliquely across the outer part of the cheek to the base of the nose at its junction with the forehead, over the opposite side of the head and downward behind the mastoid process. A circular turn then is carried around the head, overlying exactly the original turns. A

FIGURE 26.—Recurrent turns. (Eliason.)

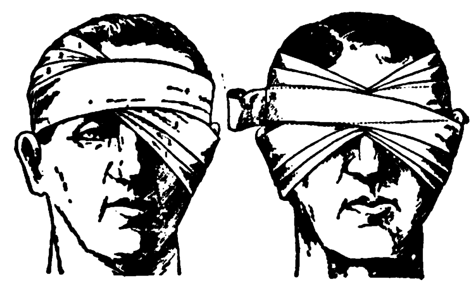


FIGURE 27.—Crossed bandage (figure-of-eight) of one eye and of both eyes. (Eliason.)

second turn under the ear and across the face and head then is applied, overlapping the upper two-thirds of the preceding turn. These alternating turns are repeated until the eye (and if more comfortable, the ear on the same side) is completely covered. The bandage is completed with a final circular turn around the head. It is used for retention of dressings of the eye (fig. 27).

(5) *Crossed bandage of both eyes.*—The initial turns are applied as for one eye and the bandage carried forward below the right ear, diagonally upward across the cheek to the base of the nose and over the opposite side of the head above the left ear, and downward behind the left mastoid process. Then a circular turn is applied. When the roller reaches the back of the head below the bony prominence, it is carried obliquely forward and slightly upward over the right ear across the forehead and downward over the left eye, the lower margin of the bandage crossing the previous turn at the junction of the nose with the forehead. The bandage then is carried across the left cheek below the left ear and backward to the nape of the neck. Then a circular turn is made, followed by a repetition of the previous turns across the eyes, each circular turn

accurately covering its predecessor and each oblique turn overlying the upper one-half of the preceding turn until both eyes are completely covered. The ears may or may not be included in the bandage, which is completed by two circular turns around the head. Pins are placed at the interesections of the bandage (fig. 27).

(6) *Sayre's dressing.*—This consists of two strips of adhesive plaster 3 inches wide and 2 yards long. Two circular turns of a flannel bandage 4 inches wide are applied to the arm of the affected side just below the axillary fold. The end of one adhesive strip is looped around the arm (overlying the flannel bandage) and pinned, with the loop sufficiently large not to constrict the arm. With the

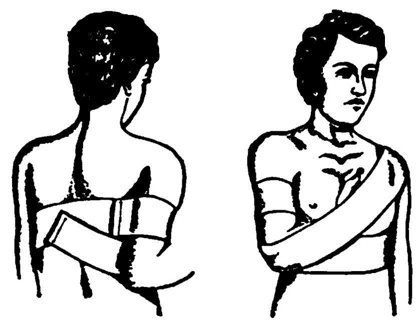


FIGURE 28.—Sayre's dressing for fracture of the clavicle, showing application of first and second strips. (Wharton.)

arm drawn upward and backward, the strip of plaster is carried across the back and around the opposite side of the chest. It may end here or be carried completely around the chest. The hand of the injured side now is placed as near as possible to the shoulder of the sound side, the skin surfaces being separated by sheet wadding. The end of the second strip is applied over the scapula of the affected side (some surgeons start this strip at the top of the posterior surface of the arm of the affected side; others apply the initial end of this strip on the shoulder of the sound side) and is carried downward on the posterior surface of the arm of the affected side, under the point of the elbow, diagonally across the chest on the posterior surface of the forearm and hand over the sound shoulder down the back where it joins the first strip of plaster. A small hole is cut in this strip to receive the point of the elbow, which must be protected by a layer of cotton or sheet wadding. Then the entire dressing is covered with a Velpeau bandage. It is used for treatment of fractures of the clavicle (fig. 28).

(7) T-*bandage.*—This bandage consists of a horizontal bandage to which is attached, about its middle, a vertical bandage of approxi-

mately one-half the length of the horizontal bandage. The horizontal portion is employed to secure the bandage to the body, the vertical portion being used to retain dressings. This bandage is very useful in retaining dressings about the perineum and anal region. When used for this purpose, the horizontal band is applied around the abdomen above the iliac crests in such manner that the vertical portion is placed exactly in the midline of the back directly over the spine. The vertical portion then is brought forward between the thighs and secured to the horizontal portion in front of the abdomen, The vertical portion may be split longitudinally to form two strips of equal width.

(8) *Double* T-*bandage.*—This differs from the T-bandage in having two vertical strips instead of only one. The horizontal portion may be of any desired width. It frequently is used for the retention of dressings of the chest, breast, and abdomen. When so employed, the two vertical strips are carried over the shoulders from the back to the front and secured by pins to the horiztonal portion.

(9) *Tailed bandage.*—(*a*) The four-tailed bandage is made readily by splitting a strip of muslin or other material of the desired width, lengthwise, within a few inches of the center of the strip. This provides a bandage with a body and four tails.

(*b*) The many-tailed bandage is prepared in a similar manner, by splitting the muslin or other material into several strips, having a sufficiently large area in the center for the retention of dressings, etc. The number of tails on each side should be the same.

(10) *Plaster of paris bandage.*—These bandages are prepared by impregnating the meshes of crinoline with plaster of paris of the extra calcined, dental variety. A strip of crinoline about 3 or 4 inches wide and usually 4 or 5 yards long, is placed on a table. Plaster of paris then is dusted upon the strip and evenly rubbed into the meshes of the fabric. A very satisfactory method of preparing this bandage is by constructing a wooden box 12 inches long, 6 inches wide, and 3 inches deep, and at each end, just above the bottom of the box, cutting a slit 5 inches long and $\frac{1}{8}$ to $\frac{1}{4}$ inch wide. The end of the bandage is drawn into the box through one slit across the bottom of the box and out of the box through the other slit. A sufficient quantity of the plaster of paris to cover the bandage with a layer of powder 1 inch deep is placed in the box. As the bandage is drawn through, plaster of paris is rubbed into the meshes with the hand or preferably with a smooth piece of wood approximately 4 inches in length. The bandage may be loosely rolled into a cylinder as it emerges from the box. If the bandages

are not to be used within a few hours, they should be wrapped in paper to prevent absorption of moisture.

(*a*) *Application.*—The part to be encased in plaster of paris should be covered with a suitable bandage of soft material, preferably flannel. The bony prominences should be well protected with cotton. Care should be taken to remove all creases in the dressing and bandage. Two rolls of the plaster of paris bandage are placed in warm water. When bubbles cease to arise from the bandage one roll is removed from the water, the excess water being expressed by grasping the roll at its two ends and exerting pressure with the hands. This method prevents the loss of a considerable amount of plaster through the ends of the roll.

NOTE.—As soon as a bandage is removed from the water replace it with another bandage.

The bandage should be applied rapidly and evenly to the limb. No special form of bandage is necessary as it is sufficient that the part be properly covered. The second bandage is applied as soon as the first has been completed. During the application of the bandage it should be rubbed with the hands in order to provide a smooth, even surface. It also is desirable to rub some loose plaster into the dressing. When the final roller has been applied, the surface of the completed dressing should be rubbed evenly with liquid plaster prepared by addition of water to dry plaster until it has the consistency of thick cream. In many cases, such as compound fractures, it is frequently necessary to provide access to certain areas of the encased limb. After the bandage has partially set, a "window" or trap may be cut in the bandage over the desired area. Removal of a plaster of paris bandage may be accomplished with the aid of a plaster saw. If none is available, the plaster may be softened with a small amount of peroxide of hydrogen, hydrochloric acid, or vinegar, and then may be cut with a knife.

(*b*) *Uses.*—This bandage is used for fixation of fractures; ambulant treatment of fractures; fixation and treatment of injuries and diseases of joints.

(11) *Starched bandage.*—This bandage may be obtained already prepared or it may be prepared in the following manner: Starch is mixed with cold water until a thin, creamy mixture results. This is heated to form a clear mucilaginous liquid. The part should be covered with a flannel bandage over which a gauze bandage is applied. The starch then is rubbed evenly into the meshes of the material. A second gauze bandage is applied and again treated with the starch mixture. This may be repeated until the desired thickness of the bandage is obtained. Bandages impregnated with starch may be

moistened and applied wet to a part. This type of bandage is occasionally useful in the treatment of sprains of the thumb or fingers.

(12) *Triangular bandage.*—This bandage, also known as the handkerchief bandage, is used for the temporary or permanent dressing of wounds, fractures, dislocations, etc., and for slings. It is very valuable in first-aid work as it is quickly and easily applied, stays on well, and can be improvised from any kind of cloth, as a piece of a shirt, an old sheet, a large handkerchief such as the Navy uniform neckerchief, etc. Unbleached muslin is generally used in making triangular bandages, although linen, woolen, silk, etc., will answer the purpose. In making them, a square of material about 3 by 3 feet or slightly more is folded diagonally to make one bandage or may be cut along the fold to make two bandages. The long side of the triangle is called the "base", the point opposite the base is called the "apex", and the points at each end of the base are called the "ends" or "extremities." These bandages may be used either as a triangle or as a cravat, the latter being made from the triangle by bringing the apex to the base and folding it upon itself a sufficient number of times to obtain the width desired (fig. 29). The names of these bandages indicate the part of the body to which the base is applied, the location of the apex, and the shape. For example, in the fronto-occipital triangle the base of a triangular bandage is applied to the forehead and the apex is carried to the occiput, and in the mento-vertico-occipital cravat the middle of the base is placed under the chin and the ends carried over the vertex of the skull to the occiput. A few of the more commonly used triangular bandages are as follows:

(*a*) *Fronto-occipital triangle.*—Place the middle of the base of the triangle on the forehead so that the edge is just above the eyebrows and bring the apex backward over the head, allowing it to drop over the occiput. Bring the ends of the triangle around to the back of the head, above the ears, cross them over the apex at the occiput, and carry them around to the forehead and there tie them in a square knot. Finally turn up the apex toward the top of the head and pin with a safety pin or turn up the apex and tuck it in behind the crossed part of the bandage. It is used to retain dressings on the forehead or scalp (fig. 30).

(*b*) *Triangle of chest or back.*—Drop the apex of the triangle over the shoulder on the injured side and bring the bandage down over the chest (or back) to the level desired and so that the middle of the base is directly below the shoulder. Carry the ends around the body and tie in a square knot on the back. Finally, bring the apex down on the back (or chest) and tie it in a square knot to one of the ends.

It is used to retain dressings on burns or wounds of the chest or back (fig. 31).

(*c*) *Brachio-cervical triangle, or arm sling.*—The arm to be put in the sling should first be bent at the elbow so that the little finger is about a hand's breadth above the level of the elbow. Drop one end of the triangle over the shoulder on the uninjured side and let the bandage hang down over the chest with the base toward the

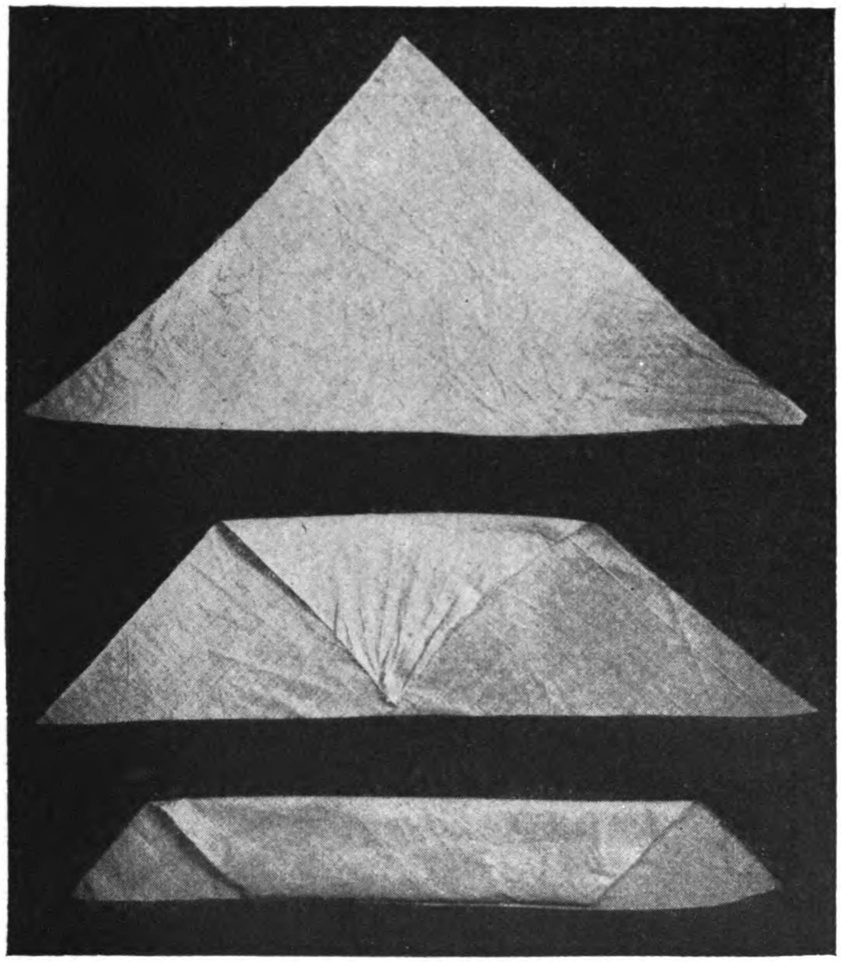


FIGURE 29.—Folding cravat from triangle.

hand and the apex toward the elbow. Slip the bandage between the body and the arm, carry the lower end up over the shoulder on the injured side, and tie the two ends together at either side of the neck, using a square knot. Draw the apex of the bandage toward the elbow until it is snug, bring it around the elbow to the front, and after folding back a little, fasten it to the front of the bandage with a safetypin. The lower end of the bandage may be passed between the arm and the body and under instead of over the injured

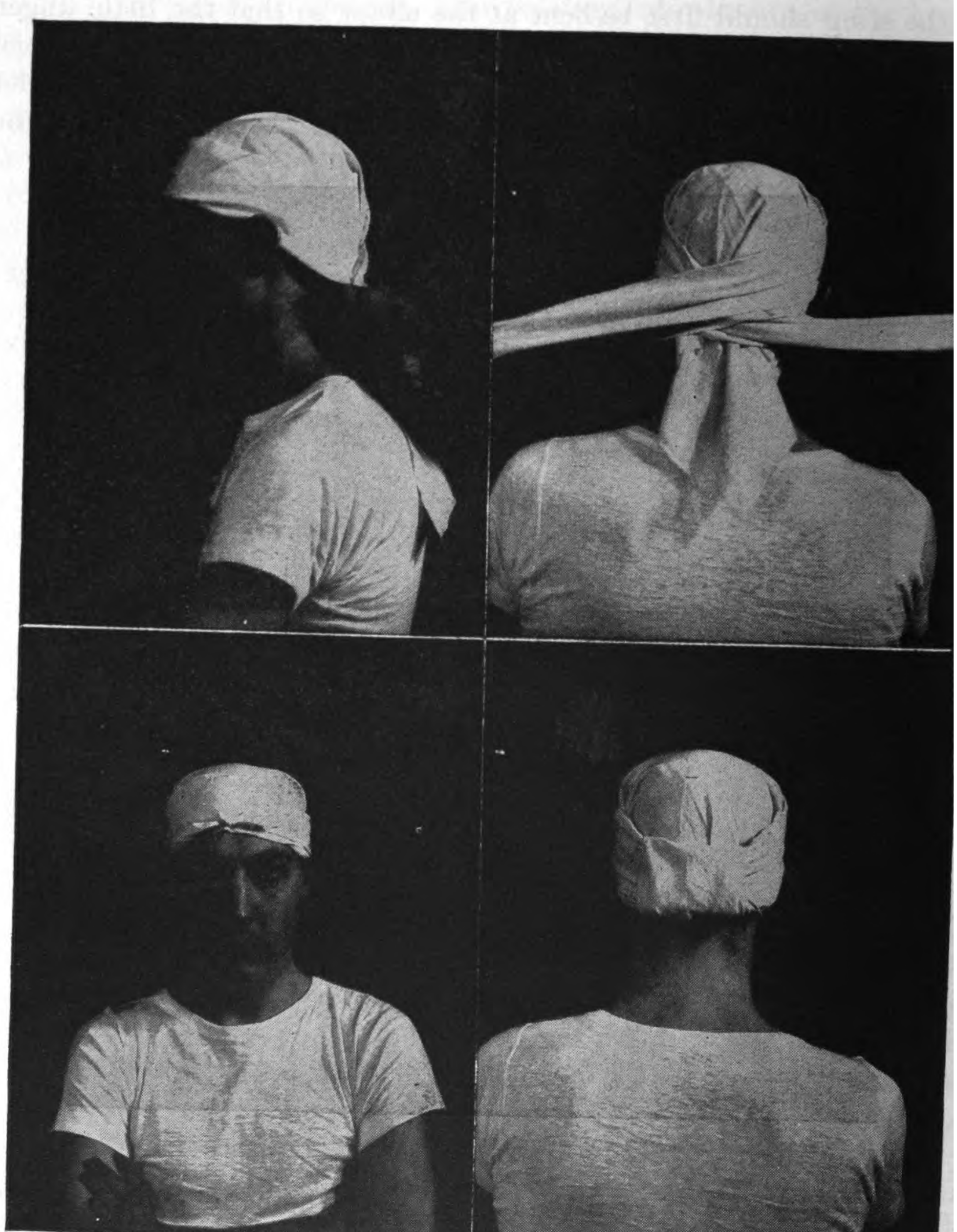


FIGURE 30.—Fronto-occipital triangle.

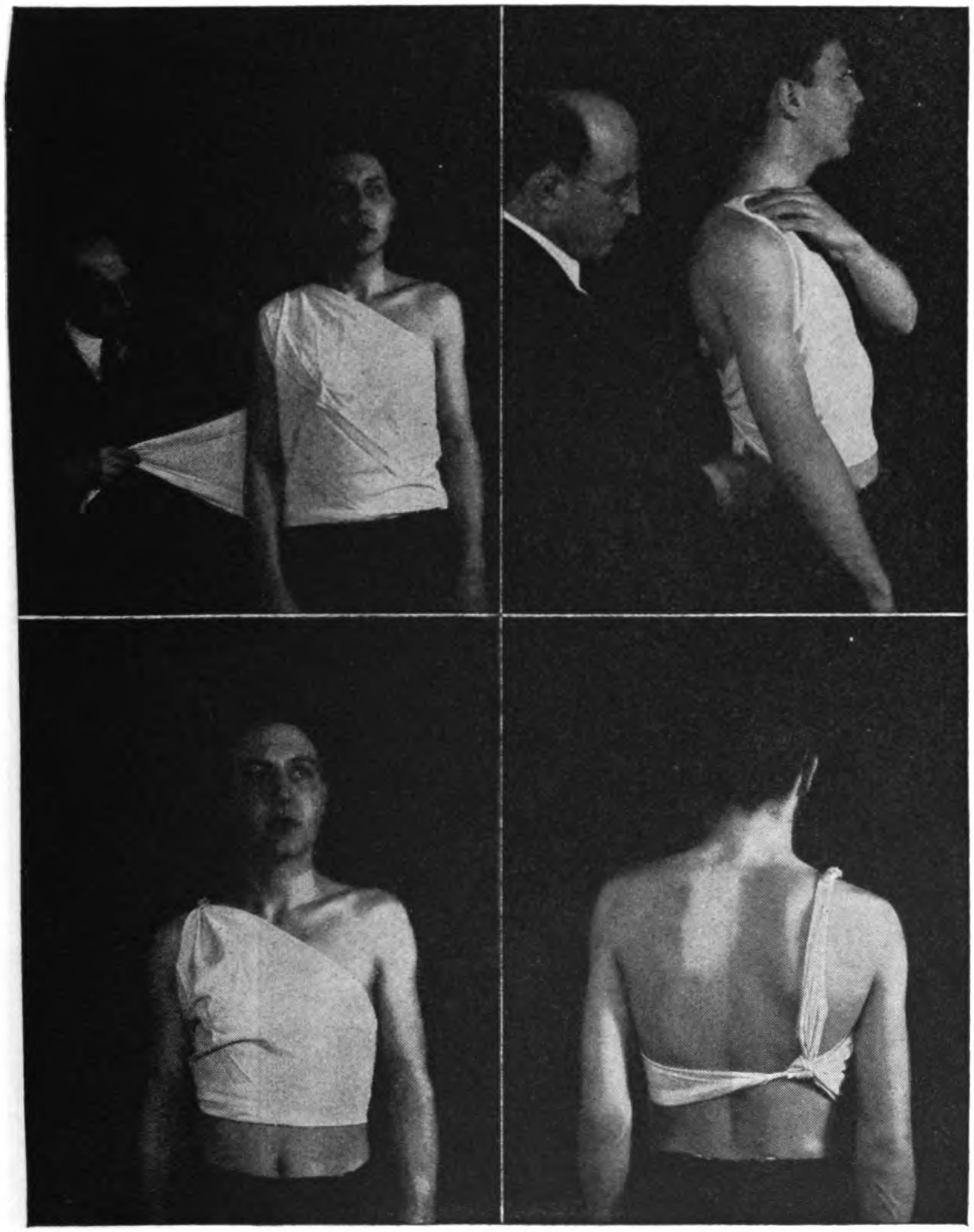


FIGURE 31.—Triangle of chest or back.

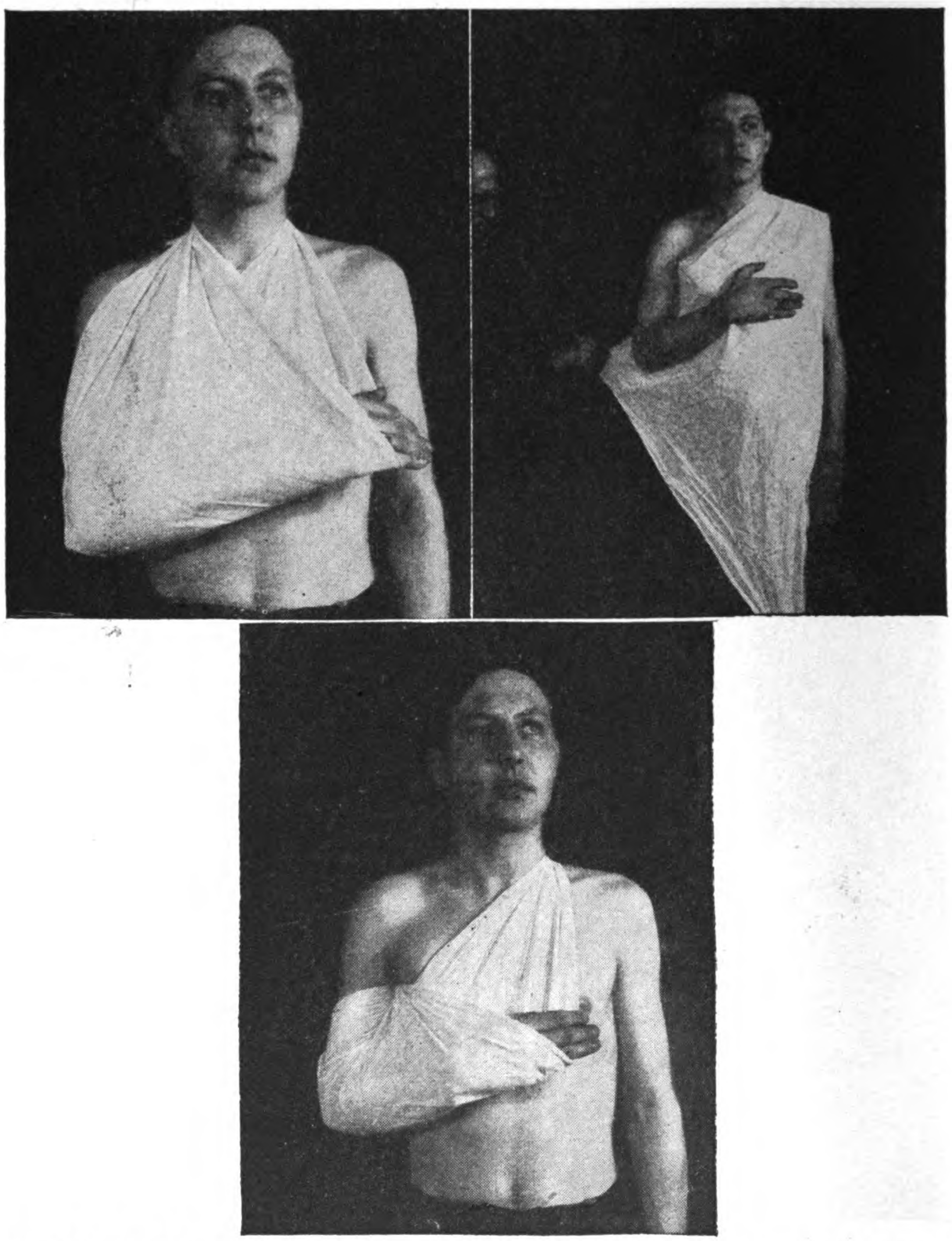


FIGURE 32.—Brachio-cervical triangle or arm sling showing lower end passing between arm and body.

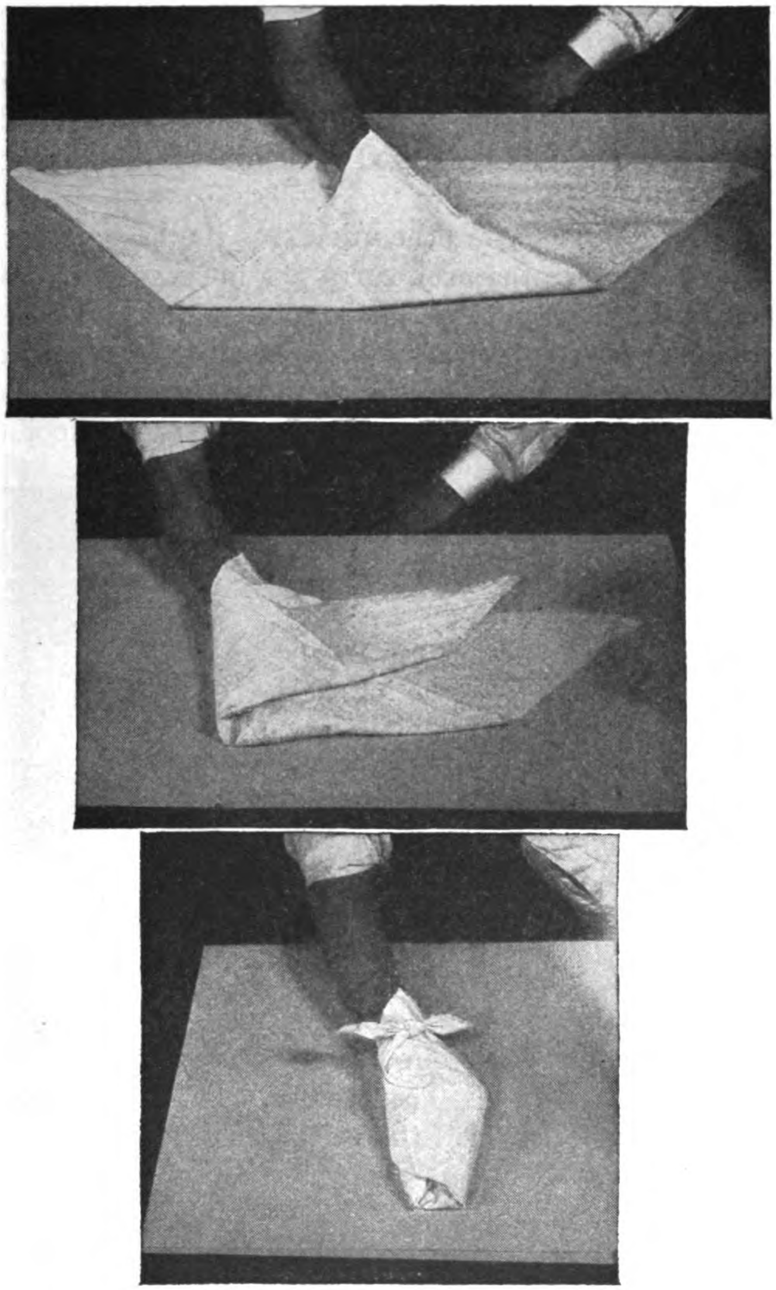


FIGURE 33.—Triangle of hand.

shoulder before tying to the other end. The ends of the fingers should extend slightly beyond the base of the triangle (fig. 32).

(*d*) *Triangle of hand.*—Place the middle of the base of the triangle well up on the palmar surface of the wrist, carry the apex around the ends of the fingers and over the dorsum of the hand to the wrist or forearm, fold each half of the part at the sides of the hand back toward the opposite side of the wrist, cross the ends around the wrist, and tie in a square knot. It is used to retain dressings of considerable size on the hand (fig. 33).

(*e*) *Triangle of foot.*—Place the middle of the base of the triangle on the ankle well above the heel, carry the apex around the ends of the toes and over the dorsum of the foot to the ankle, fold each half of the part at the sides of the foot back toward the opposite side of the ankle, cross the ends around the ankle, and tie in a square knot. It is used to retain dressings of considerable size on the foot (fig. 34).

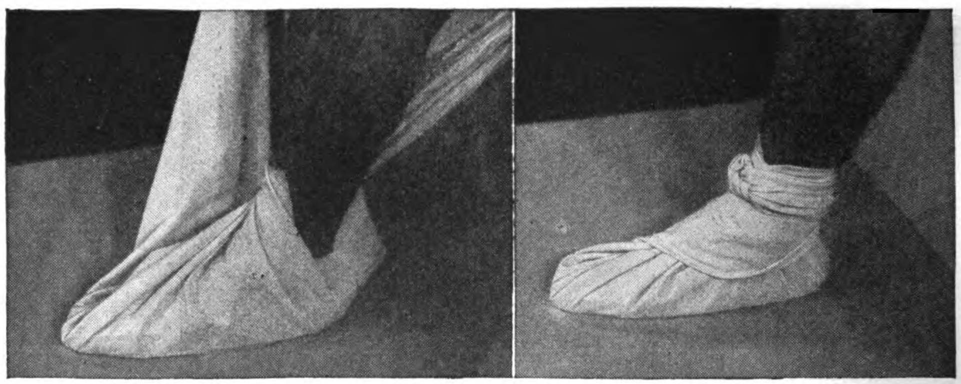


FIGURE 34.—Triangle of foot.

(*f*) *Gluteo-femoral triangle.*—To apply this bandage requires two bandages, one a triangle, the other a cravat. First fasten the cravat around the waist. Place the base of the triangle in the gluteo-femoral fold and carry the ends around the thigh to the front where they are tied with a square knot. The apex is then carried upward and passed under the cravat around the waist, turned down and fastened to the triangle with a safetypin. It is used to retain dressings on the buttock or hip (fig. 35).

(13) *Cravats.*—(*a*) *Mento-vertico-occipital cravat.*—After making a triangle into a cravat of the proper width, place the middle of the cravat under the chin, carry the ends upward in front of each ear to the vertex of the skull, crossing them there, and continuing downward to the occiput where they are tied in a square knot. Uses: To retain dressings on the chin, cheeks, and scalp, and as a temporary dressing to secure fixation of the parts in fracture or dislocation of the jaw (fig. 36).

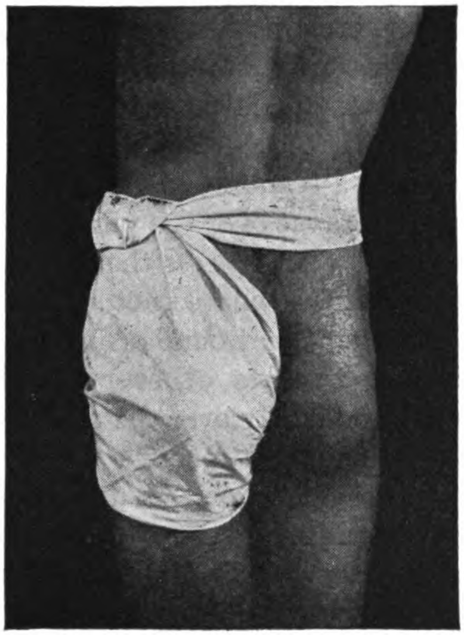


FIGURE 35.—Gluteo-femoral triangle.

FIGURE 36.—Mento-vertico-occipital cravat.

FIGURE 37.—Bis-axillary cravat.

FIGURE 38.—Cravat of head or ear.

(b) *Bis-axillary cravat.*—After making a triangle into a cravat of the proper width, place the middle of the cravat in the axilla, carry the ends upward to the top of the shoulder, crossing them there and continuing across the back and chest, respectively, to the opposite axilla, where they are tied in a square knot. It is used to retain dressings in the axilla or on the shoulder (fig. 37).

(c) *Cravat of head or ear.*—After making a triangle into a cravat of the proper width, place the middle of the cravat over the point desired, carry the ends to the opposite side of the head, cross them, and bring them back to the starting point and tie with a square knot. Use: To apply pressure to control serious hemorrhage from wounds (fig. 38).

129. Dressings.—*a. Types.*—A dressing consists of everything used to cover or dress a wound. The pad put directly over the wound is called a "compress." In ordinary emergency treatment, a wound dressing consists of a compress with bandage to hold it on. A dressing may be either dry or wet, asceptic or antiseptic.

(1) An *asceptic dressing* is one which is sterile, that is, with no bacteria on it.

(2) An *antiseptic dressing* is one which, in addition to being sterile, contains some substance for killing bacteria.

(3) A *wet dressing* generally is an antiseptic dressing and is used in wounds where infective inflammation is going on. Wet antiseptic dressings generally are made up of a layer of sterile gauze saturated with the antiseptic solution. A layer of sterile cotton is then applied, with some impervious material such as oiled silk put over the dressing to retain the moisture, and a bandage over all. The dressing must be kept wet with the antiseptic solution, either by frequent changing or by having perforated rubber tubes between the gauze and cotton through which the dressing can be periodically moistened with the antiseptic solution.

(4) A *dry dressing* is used to cover a recent wound which is considered to be free from infection.

b. Purpose.—The purpose of a wound dressing is to stop hemorrhage, to prevent introduction of bacteria, and to prevent further injury to the wound.

c. Types in first-aid packet.—The Army supplies two first-aid packets, one small and one large, which are hermetically sealed tin cans containing dry sterile dressings. (See figs. 39 to 42, incl.). All these dressings consist of a sterile gauze compress with bandages attached.

d. Preparation of wound for dressing.—(1) *General.*—Any piece of cloth, such as gauze, cotton, linen, muslin, or a handkerchief, provided it is rendered sterile, is suitable for a compress in case of emer-

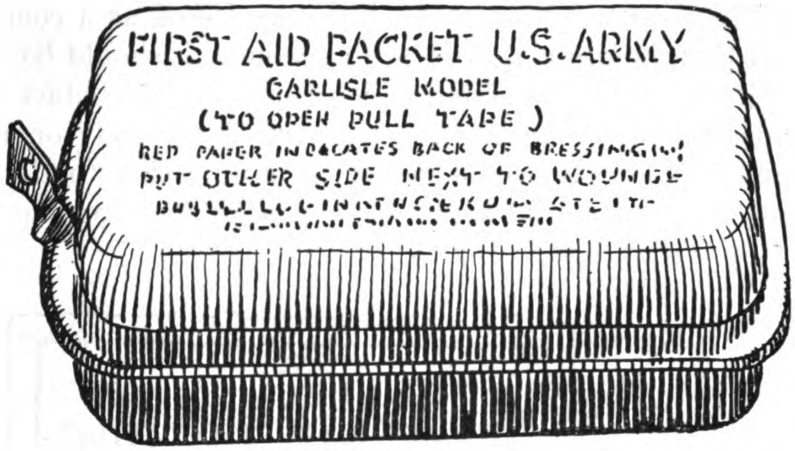


FIGURE 39.—First-aid packet, U. S. Army.

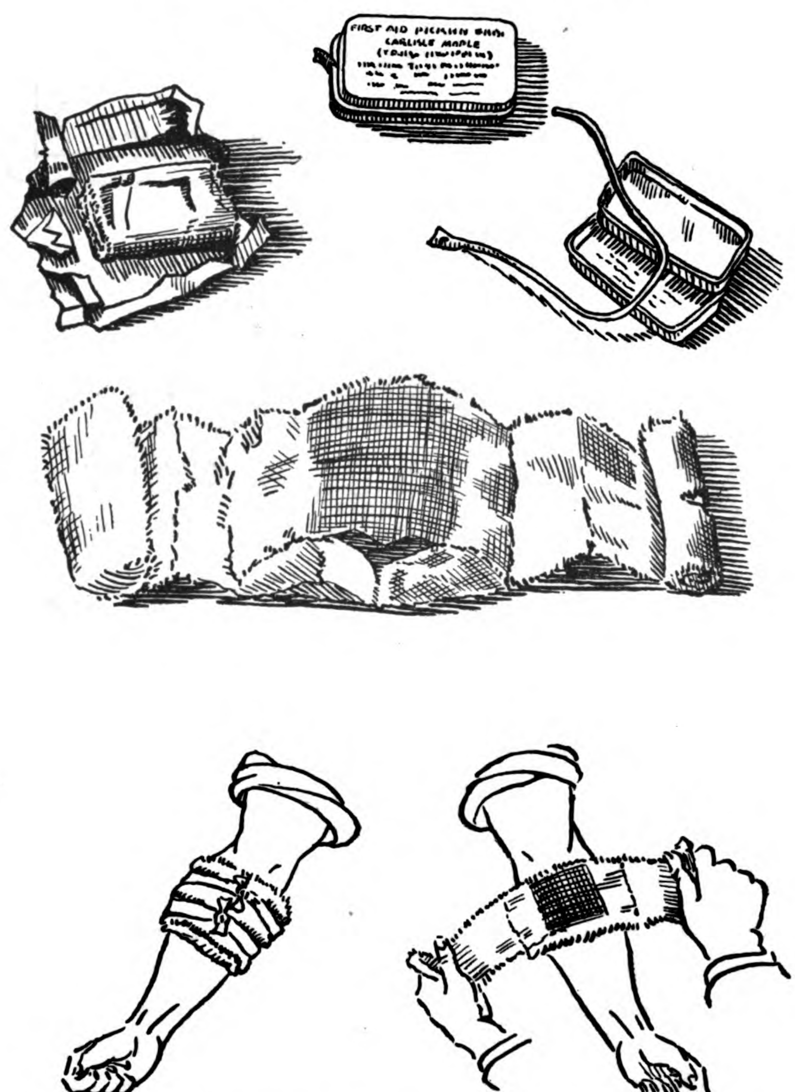


FIGURE 40.—Application of dressing, first-aid packet, small.

gency. The most vital point about material used as a compress of a wound is that, before it is applied to a wound, it should be rendered sterile. The part of the dressing which is to come in contact with the wound must not be touched with any part of the body or anything else except sterile instruments before its application to the wound. In an emergency, material to be used in a wound dressing may be sterilized by boiling it for 10 minutes.

FIGURE 41.—First-aid dressing, large.

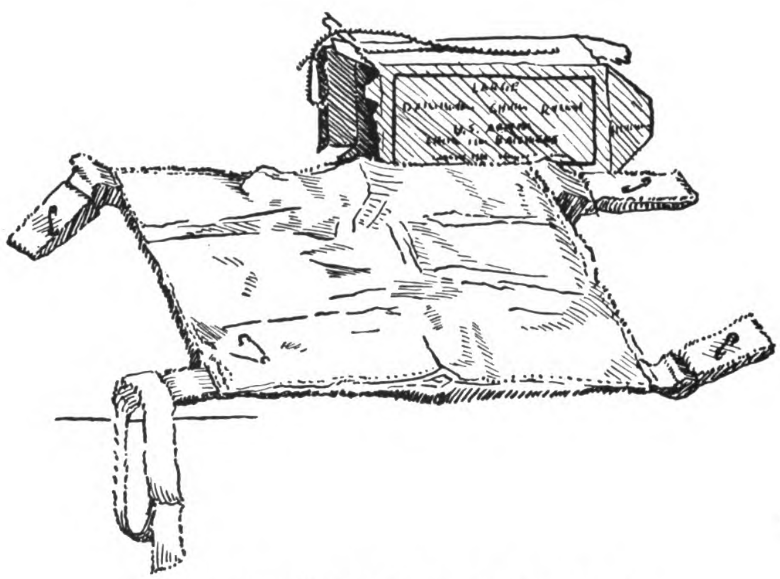


FIGURE 42.—First-aid dressing, large, open.

(2) *Procedures.*—When a patient can be brought under the care of a medical officer in the near future, the procedure necessary in the first-aid treatment in the case of ordinary wounds is to stop the hemorrhage, treat the shock, and apply a sterile dressing to the wound. If a medical officer is not available, the wound must be further treated as described below.

(*a*) In treating a freshly made wound, the following procedure is recommended:

1. Cleanse the hands as thoroughly as possible by a thorough scrubbing with soap and hot water, followed, if possible, by immersion in hot 1–2,000 bichloride of mercury solution and then 70 percent alcohol.

2. Sterilize all instruments to be used in removing foreign bodies such as dirt, glass, splinters, or for shoving the skin about the wounds.

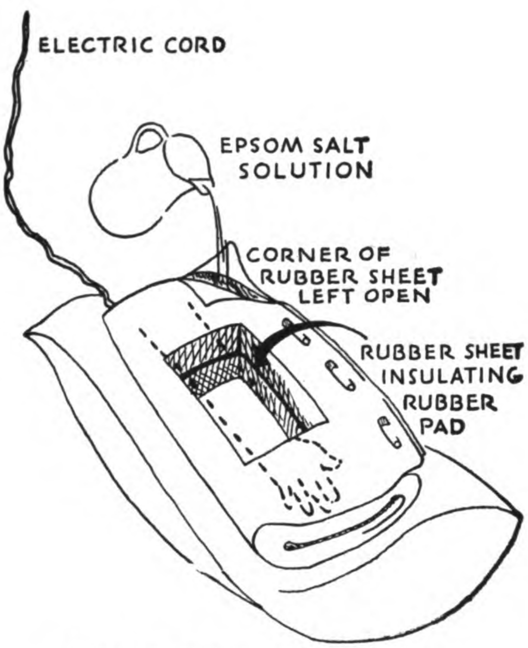


FIGURE 43.—Type of wet dressing.

3. If there is bleeding, arrest the hemorrhage.

4. If there is grease in or about the wound, remove it with turpentine or gasoline.

5. Remove all foreign particles with sterile forceps.

6. Apply tincture of iodine to all parts of wound and the skin about the wound for a distance of about one-half inch beyond the wound edges. After the skin has been well dried, the wound edges are brought together and a dry dressing applied.

7. There is no substance which should be used by the first-aid man to wash a wound; more dirt is washed in than out, and ordinary water is dangerous since it is not sterile. Strong antiseptics, such as bichloride of mercury or phenol, will destroy the cells of the body which dispose of

the pus bacteria before they kill the latter. Peroxide of hydrogen is not strong enough to kill all bacteria and in large or deep wounds it washes some of these bacteria to uninfected parts which then become infected. *Tincture of iodine is the only substance to be used in an ordinary fresh wound by the first-aid man, aside from benzine and gasoline to cut grease, if present.*

(*b*) The manner in which a wound showing evidence of infective inflammation is treated is as follows:

1. Elevate the part.
2. Put it at rest.
3. Remove foreign bodies, if present.
4. Remove sufficient sutures, if present, to obtain good drainage.
5. Insert drain.
6. Apply a wet antiseptic dressing (fig. 43).
7. Treat the constitutional symptoms.

Section III

SPLINTS AND THEIR APPLICATION

130. General.—*a.* Splints are devices used for the fixation of broken bones. They are used in the emergency treatment, as well as in the final treatment, of a fracture. It is most important to fix a broken bone as soon as possible after injury. In fractures of large bones, especially of the thigh bone (femur), the injured person within a short time often enters into a state of shock or collapse which may cause death. Fixation of the fractured part with adequate splints as soon as the injured person is seen prevents the development of more shock, or if shock has not already set in, it may not occur. It should be remembered that in addition to splinting the fracture, the patient should be covered with blankets and given hot drinks, if possible, to aid in the prevention or decrease of shock.

b. Fixing the fragments of a broken bone prevents the rough and jagged edges of the bone ends from injuring and tearing nearby

blood vessels and nerves, thus serious bleeding and paralysis is avoided. In simple fractures (one in which the bone has not punctured the skin) proper application of a splint will prevent penetration of the skin by fragments of bone and introduction of infection into deeper tissues. If the fracture is compound (one in which the skin has been punctured by a fragment of bone) splinting will prevent the bone from sliding in and out of the wound and the introduction of more infection. In addition, proper splinting greatly relieves the pain associated with the fracture. The patient is made much more comfortable and the amount of shock is reduced.

c. Thus, proper splinting of a fracture prevents the occurrence of, or increase of, the following:

(1) Shock.

(2) Local tissue damage (to nerves and blood vessels).

(3) Infection.

d. Always remember that every fracture of a long bone should be *splinted where they lie.*

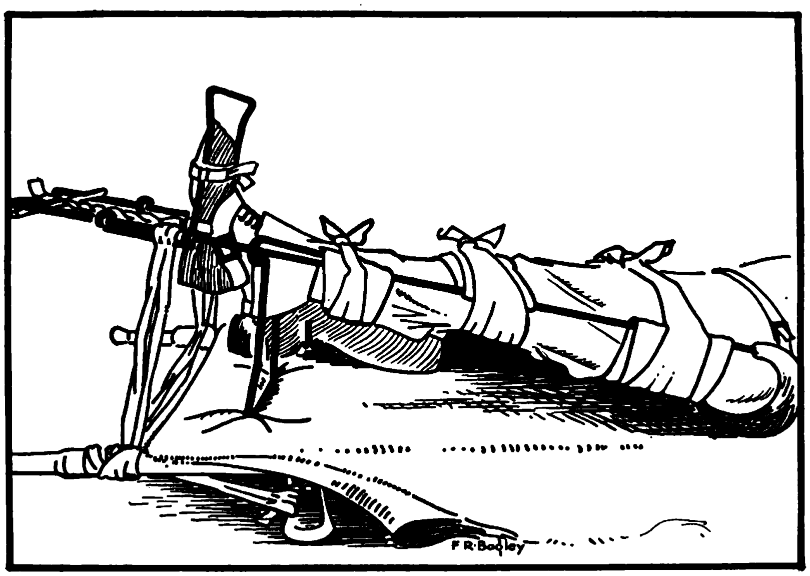


FIGURE 44.—Army hinged half-ring thigh and leg splint.

131. Army hinged half-ring thigh and leg splint.—*a*. The Army leg splint is the most valuable of all splints when the saving of life is considered. It is used in nearly all fractures of the femur and can be used in fractures of the leg as far down as the ankle. The mortality rate for compound fractures of the femur was reduced from 50 percent to 15 percent in one army during the World War due to proper splinting of this bone.

b. For the purposes of training, application of the Army leg splint is done in 10 steps with a team of four men consisting of the following:

No. 1. Operator.
No. 2. First assistant.
No. 3. Second assistant.
No. 4. Patient.

NOTE.—The procedure here described appears in the pamphlet *The Demonstration and Application of the Army Leg Splint* (1940, Revised), published by the Medical Field Service School, Carlisle Barracks, Pennsylvania.

c. The equipment required for each team is as follows:

(1) One litter, standard wooden pole or aluminum.

(2) One Army leg splint, half-ring, hinged.

(3) Two footrest and splint supports.

(4) One traction strap.

(5) Two rolls of muslin bandage, 5 inches by 5 yards, and one gauze bandage.

(6) Three blankets.

(7) Six safetypins.

(8) One first-aid packet.

d. The 10 steps are as follows:

(1) Dress litter.

(2) Extension.

(3) Dress wound.

(4) Apply splint.

(5) Support leg.

(6) Traction strap.

(7) Footrest.

(8) Foot splint support.

(9) Fix splint.

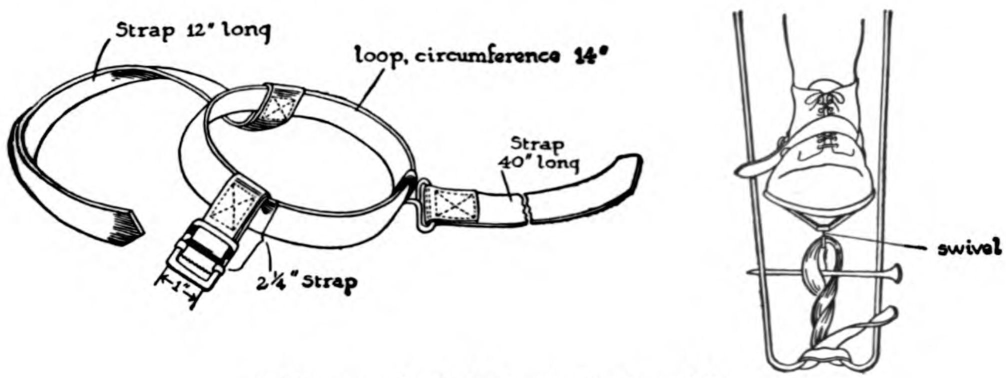
(10) Cover patient.

e. The procedure is as follows:

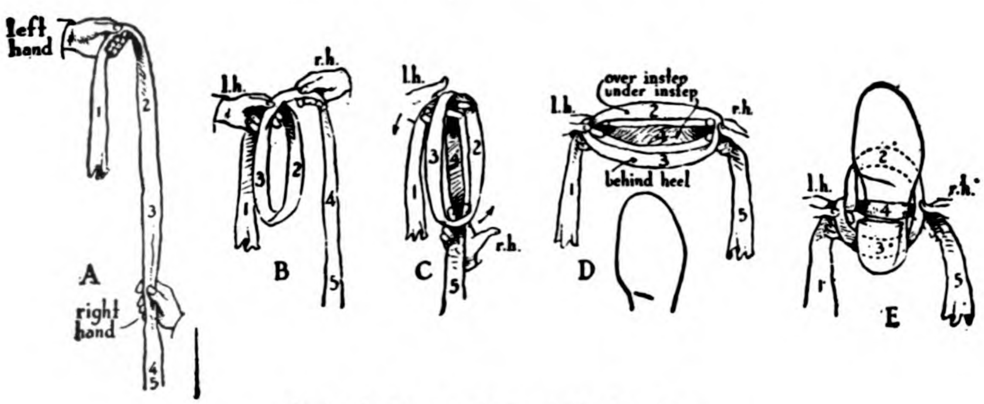
(1) *Step No. 1, dress litter.*—The litter is "dressed" by Nos. 2 and 3. A litter is said to be dressed when blankets have been arranged upon it as follows: Place the first blanket on the litter lengthwise so that one edge corresponds to the outside pole of the litter and its upper edge is even with the head of the canvas. Then fold it back upon itself once, leaving the folded edge even with the inside pole of the litter. Place the second blanket folded lengthwise on the first so that one edge corresponds to the inside pole of the litter, and its upper edge is even with the head of the canvas. Then fold it back upon itself once in the same manner as the first. The free edges

of each of these blankets hang over opposite sides of the litter. The No. 4 man now lies on the litter and acts as patient. The third blanket is placed under the patient's head until the tenth step.

(2) *Step No. 2, extension.*—The No. 2 man of the team stands at the foot of the litter facing the patient. Grasping the heel of the shoe with his right hand and the toe with his left, keeping the arm straight, he exerts a steady pull to produce the necessary traction. The litter sling may be placed across the patient's chest, under the arms, and attached to the litter stirrup to provide countertraction. Traction should be continued until the traction strap has been fixed.



① Strap made of 1-inch nonelastic webbing.



② Angle hitch using muslin bandage.

FIGURE 45.—Adjustable traction splint strap.

(3) *Step No. 3, dress wound.*—While extension is continued by No. 2, the No. 1 and No. 3 men dress the wound designated by the instructor.

(4) *Step No. 4, apply splint.*—The splint is applied by rolling it from the outside inward, the short rod to the inner side of the leg and the half ring well up under the buttock. The splint must be horizontal. It is held in place by buckling the upper strap.

(5) *Step No. 5, support leg.*—The leg is supported on the splint by arranging the muslin bandages in the following manner:

(*a*) The first bandage is placed across the upper part of the splint under the thigh. The ends of the bandages are then reversed by crossing them under the splint and tying above and to the side.

(*b*) The second bandage is applied above the ankle in the same manner as the first.

(*c*) The third bandage is placed just above the knee. The ends are drawn downward between the two side rods of the splint and knee, are folded upward, then around the leg, and are tied on the upper outer surface.

NOTE.—The positions of the bandages may vary, depending on the location of the fracture. A fourth muslin bandage may be placed under the calf of the leg for additional support. (See fig. 44.)

(6) *Step No. 6, traction strap.*—The traction strap is applied to the foot by the No. 1 man. The loop of the strap is first placed behind the heel and under the foot, and the short buckling strap is brought over the top of the instep and buckled on the inside of the foot. The long strap is then brought over and under the end of the splint, is folded back upon itself, and is inserted through the metal ring. Traction is then maintained by pulling on the free end of the strap. The free end is now secured by tying with the ordinary cinch knot.

(7) *Step No. 7, footrest.*—The footrest is attached to the splint with the lower hooks downward and inside the splint rods. The footrest is pushed against the shoe to prevent foot drop. Spread the footrest, if necessary, for a more secure fit. Secure with bandage to prevent lateral movement of the foot.

(8) *Step No. 8, foot splint support.*—The Army leg splint is applied with the splint support fastened to the side rods of the splint in such position that it will rest on the litter end about 1½ inches from the end of the canvas. The splint support will normally rest not on the canvas of the litter but upon the blankets of the dressed litter. (See fig 46 ④.)

(9) *Step No. 9, fix splint.*—(*a*) Take a roll of the bias muslin bandage and stretch it to its greatest length.

(*b*) Tie one end of the bandage to the litter stirrup on the side of the fracture, placing the knot near the pole.

NOTE.—The knot is placed on the stirrup near the pole and the bandage wound around the bevel of the handle near the edge of the canvas to keep the bandage from slipping and becoming loose.

(*c*) Keeping a constant tension on the bandage, carry it to the bevel of the handle close to the canvas and wind it around the handle twice. (Fig. 46 ①.)

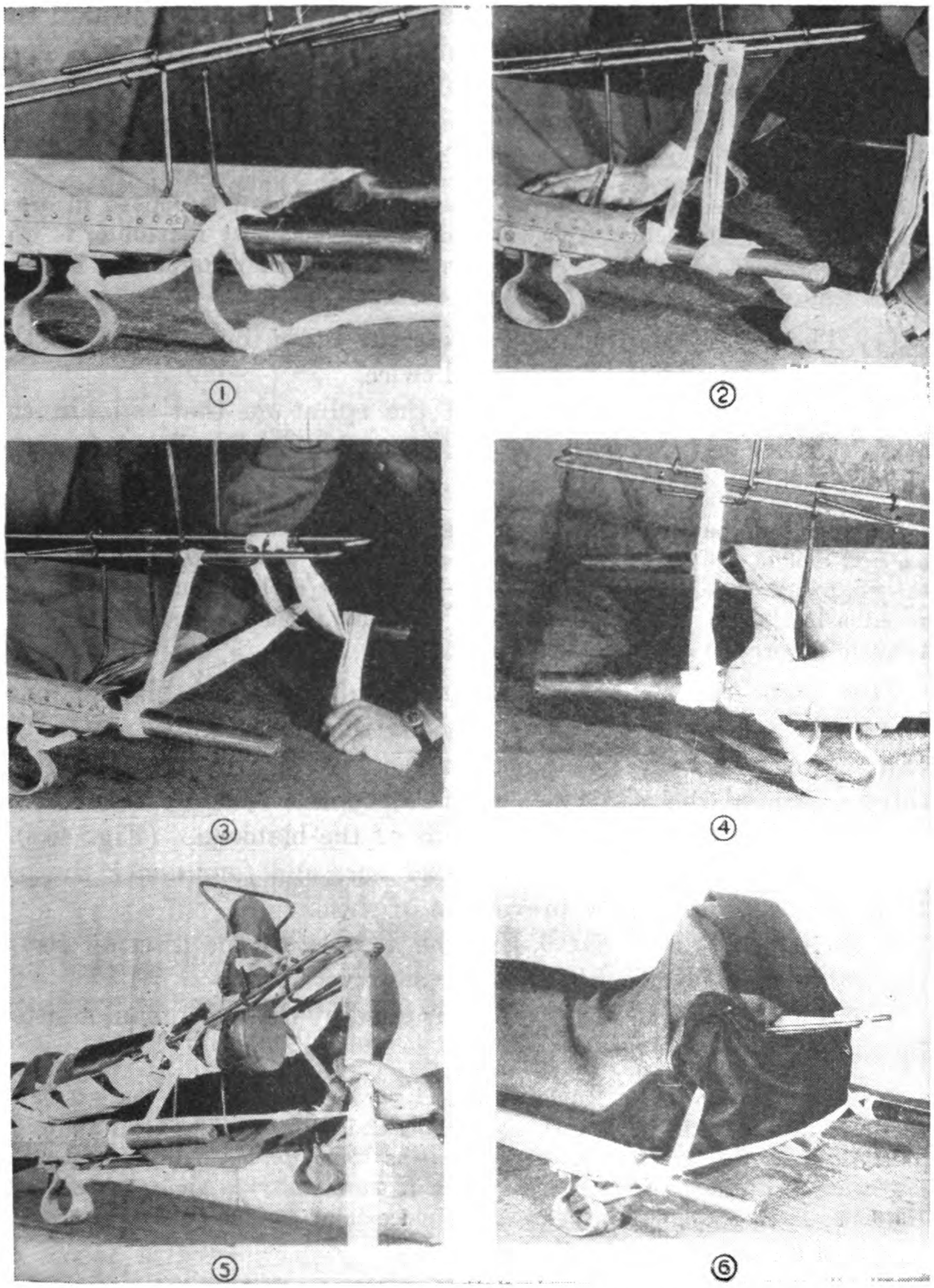


FIGURE 46.—Use of bandage for fixation of Army hinged half-ring leg splint for transportation.

(*d*) Carry the bandage to the near side of the rod of the leg splint, keeping it at a 90° angle (perpendicular) to the splint. Wind the bandage around the side rod twice and carry it back and around the same handle. Then press the splint firmly down on the litter and continue the constant pull on the bandage so that all the slack in the bandage going from the litter to the splint and from the splint back to the litter will be taken up. (Fig. 46②.)

NOTE.—The bandage is kept under constant tension as it is applied in order to overcome the elasticity. The small amount of elasticity remaining is considered beneficial. In an emergency, wire, rope, or other material can be used for fastening the splint to the handles of the litter.

(*e*) Then carry the bandage across the litter to the bevel of the opposite handle and wind it around twice.

(*f*) Next secure the side rod of the splint on that side in the same manner as was done on the near side, ending by tying the bandage to the stirrup. (Fig. 46③.)

NOTE.—When the muslin bandage is properly applied and tied, the splinted leg and end of the litter can be lifted clear of the ground without loosening the muslin bandage. The position of the splint rest on the blanket and canvas remains unaffected and the bandage is still taut when the end of the litter is again lowered to the ground. (Fig. 46⑤.)

(10) *Step No. 10, cover patient.*—Fold the third blanket once lengthwise and place it over patient, the upper edge under the chin. Next, fold the free edges of the first two blankets over the third and hold them in place with safetypins. Inclose the feet of the patient by folding the lower ends of the blankets. (Fig. 46⑥.) This gives *four thicknesses of blanket over* and *four under* the patient, thus assisting in the prevention of shock.

(11) *Alternate step No. 6.*—In the absence of the traction strap, the following may be substituted for step No. 6:

(*a*) An ankle hitch (fig. 45②) is applied by the No. 1 man, assisted by No. 3.

NOTE.—A piece of muslin bandage about 1 yard long is held in the left hand, one-third falling to the left. Pick up the long end with the right hand and form a loop. Drop the long end over the loop as if to tie a single knot, but do not bring it through the loop. The hitch is now ready to apply to the foot. Hold the hitch as shown in figure 45②, place it around the ankle, and apply the Spanish windlass.

(*b*) To apply the Spanish windlass, cross the two free ends of the bandage under the instep of the shoe; pass one free end over and one free end under the end of the splint. Bring the two ends together and securely tie to the notch at the end of the splint. Now

insert a 6-inch stick or nail between the two ends of the bandage just above the tie. Fix the stick or nail between the two rods of the splint.

f. In actual practice three persons to apply the splint will often not be available, and in emergencies or on the battlefield variations of the preceding will, of course, be necessary. However, if possible, two men should apply the splint, as it is important that one maintain a pull on the injured leg until traction is started within the splint.

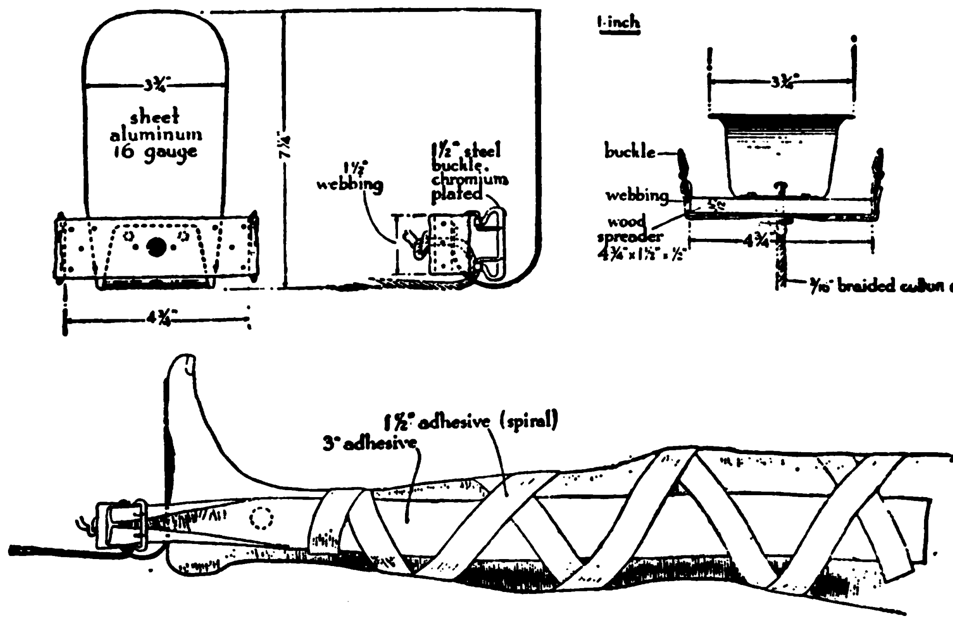


FIGURE 47.—Skin traction with zinc oxide adhesive and spreader.

g. (1) Instead of using a traction strap or ankle hitch, skin traction may be applied, using adhesive tape. This is done when it is necessary to transport the patient for a long distance and also for final hospital treatment when it is necessary to maintain traction for long periods. Before the adhesive tape is applied, the leg is shaved and cleansed with ether. A long strip of 3-inch adhesive tape is then prepared by folding one end back on itself so that two nonsticky surfaces are obtained. This doubled portion is made long enough to extend from 1 or 2 inches above the ankle to the end of the splint. A second strip is made in the same way and both are cut to the desired length. The straps thus formed are then heated over a flame and one is applied to each side of the leg extending up to thigh, slightly below the line of fracture. In fractures of the lower leg the straps are placed below the knee and extend up to within about an inch of the fracture line. The ends of straps are then tied to

the end of the splint, or to a spreader which in turn is attached to the end of the splint, and a Spanish windlass applied. Two narrow strips, 1½-inch, are then spiraled about the leg and a snug gauze or bias muslin bandage is applied about the leg to increase adhesion of the straps.

(2) An improved type of skin traction, using an adhesive solution and flannel bandage straps may be used if such is available. A satisfactory solution is Ace Adherent, which is painted on each side of the leg and on which the flannel bandage straps are applied. They are applied in the same manner as the adhesive tape straps, except that the leg is not shaved.

132. Thomas arm splint.—*a.* The Thomas arm splint is used in fractures of the arm from the shoulder down to and including the upper third of the forearm. As with the Army leg splint, it may be applied in steps for purposes of training and the following is from a pamphlet, *Demonstration and Application of the Army Arm Splint* (1939), published by the Medical Field Service School, Carlisle Barracks, Pennsylvania.

b. A three-man team is necessary:

No. 1. Operator.
No. 2. Assistant.
No. 3. Patient.

c. The equipment required for each team is as follows:

(1) Two rolls of 2-inch adhesive plaster.
(2) One Thomas arm splint with full ring.
(3) Three wooden tongue blades.
(4) Three rolls 2-inch roller gauze bandage.
(5) Three 1-yard strips of 2-inch muslin bandage for each three students.

d. The procedure is as follows:

(1) *Step No. 1, extension.*—The operator holds the full ring splint while No. 2, his assistant, inserts his right hand through the full ring. Then the No. 2 man, with his right hand, grasps the patient's injured arm firmly at the wrist and makes steady extension, placing his left hand in the armpit of the patient. The operator then puts the splint in place on the patient well up under the arm, and the end of the splint well up against the thigh of the No. 2 man. The No. 2 man then removes his left hand from under the armpit and grasps the wrist of the patient with his left hand, assisting the right hand.

(2) *Step No. 2, dress wound.*—This is done by the operator or No. 1 man. It should be done neatly and quickly.

(3) *Step No. 3, applying adhesive strips.*—Use two strips, one over the arm and one under the arm, starting about 2 inches above the elbow, down the entire length of the forearm, and about 8 inches over the hand. The two strips should be the same length.

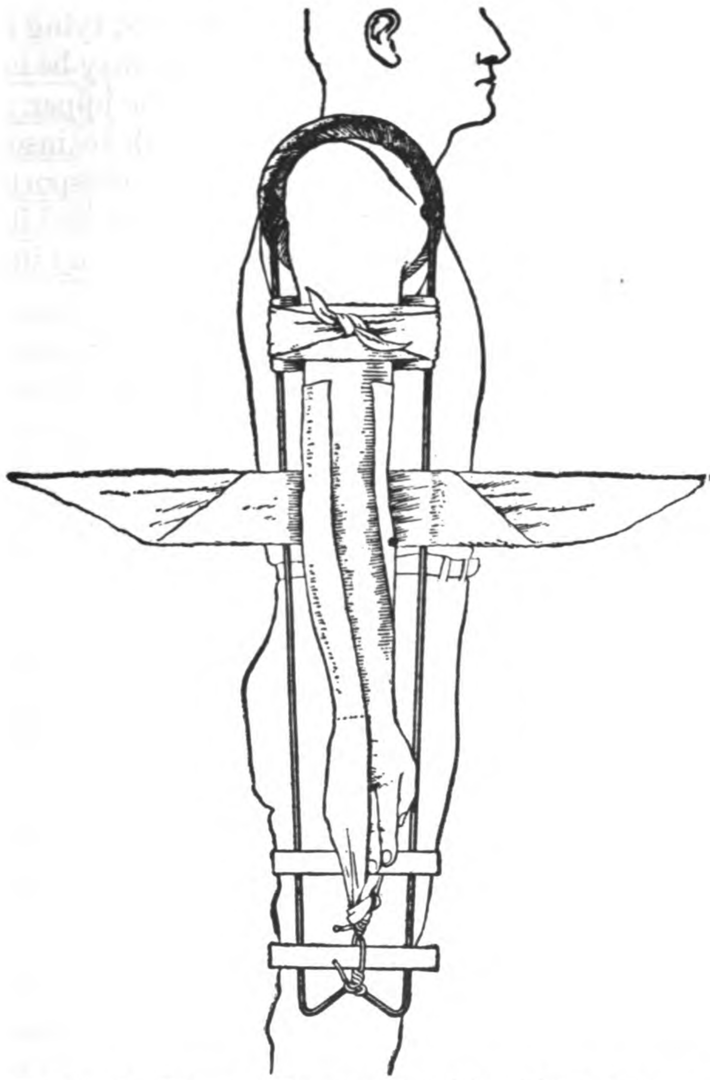


FIGURE 48.—Thomas splint, arm-hinged, for right or left arm.

(4) *Step No. 4, anchor adhesive with bandages.*—Support the adhesive strips by applying bandage. Start the bandage at the wrist and use a spiral reverse all the way up the forearm to the elbow. This anchors the adhesive strips to the arm. Do not make bandage too tight because it will affect seriously the circulation of the blood.

(5) *Step No. 5, completing fixation and traction.*—Tie the ends of adhesive together and over the end of the splint. Then with the use

of a short object, such as a stick or wooden tongue depressor, make a Spanish windlass, pulling the arm until proper extension is secured.

(6) *Step No. 6, support arm.*—Using the muslin triangular bandage, make a narrow cravat, bringing it up between the rods of the Army arm splint and over the side of the rods. Then reverse the two ends and bring them around the outside of the rods, tying on the outside of the splint. One to three of these supports may be used, one at the wrist, one just below the elbow, and one on the upper arm. The splint may then be secured to the patient's thigh to insure greater immobility of the injured limb while he is being transported.

(7) A hitch around the wrist should never be used and it should be remembered that the adhesive straps for traction extend up to a level slightly below the fracture and not above it.

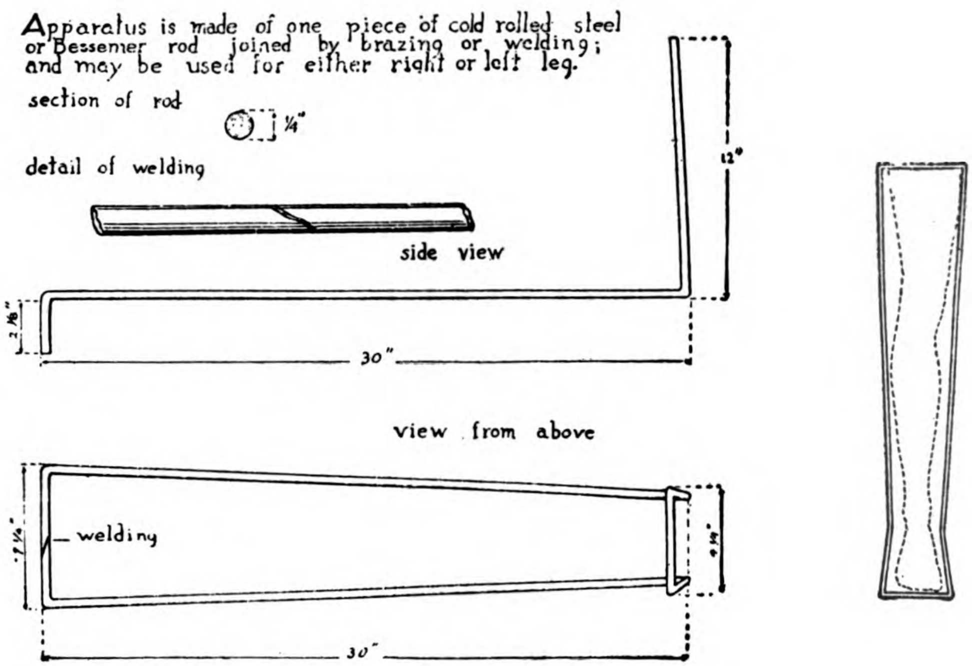


FIGURE 49.—Cabot posterior splint.

133. Cabot posterior splint.—*a.* The Cabot posterior splint is used for fixation of the leg without traction. It is used for fractures of the patella (kneecap), for sprains and other injuries in the region of the knee, for fractures of the ankle, for fractures in the lower leg when only one bone is broken (tibia or fibula), and for injuries to soft parts of the leg or foot which require fixation for transportation.

b. The splint is a frame of rolled steel rod which is bent at a right angle at one end so as to form a support for the foot, and it is long enough to extend up to the middle third of the thigh. A supporting

hammock is then made by wrapping bias muslin or gauze bandage around the lateral bars of the splint. Additional gauze and cotton padding is added as necessary to prevent pressure on the leg. The splint is then applied to the back of the leg and secured with a bandage which passes around both the leg and the splint.

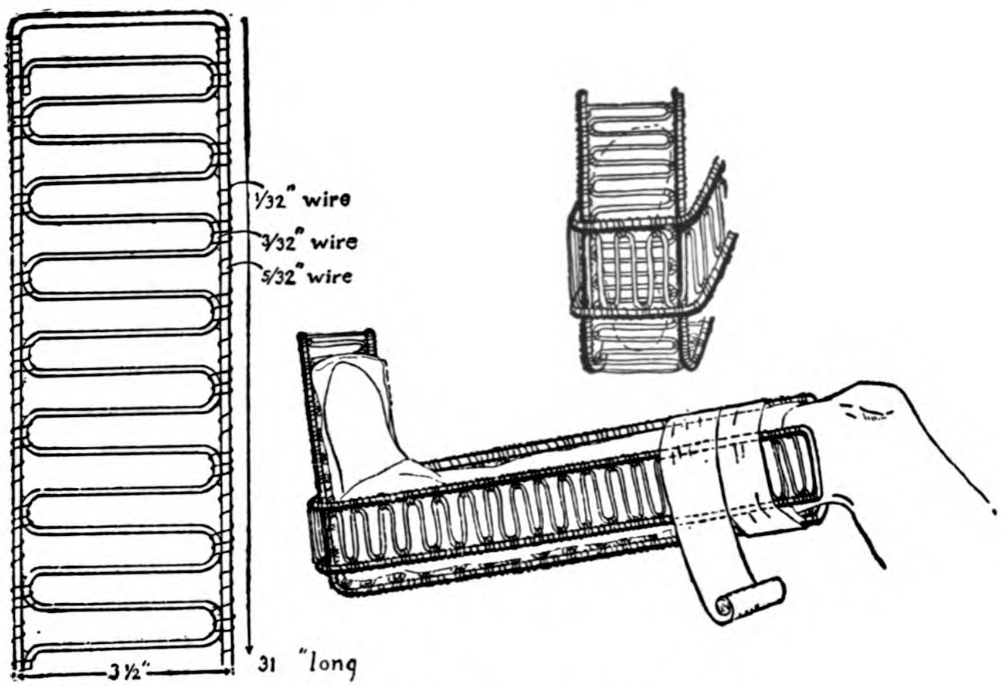


FIGURE 50.—Wire ladder splint.

134. Wire ladder splint.—*a.* The wire ladder splint is used for fractures and injuries of the foot and ankle, and to maintain a fixed position of the shoulder, elbow, or wrist when a position other than extension is desired. It is occasionally used for side splinting, in combination with a Cabot posterior splint.

b. It is made up of sheets of malleable wire in the shape of a ladder and may be molded into any desired shape and then cut into desired lengths. The splints are padded for comfort and applied with bias muslin or gauze bandage.

135. Aeroplane or abduction splint.—*a.* This splint is used for fractures of the upper end of the humerus, for fractures of the scapula (shoulder blade), for nerve injuries which cause a paralysis of the shoulder and upper arm, and for bursitis of the shoulder. It is not used in dislocations of the shoulder.

b. It is a frame of rolled steel rod which is bent at a right angle to fit under the armpit, so that the lower portion lies along the side of the chest and abdomen down to the hip. The upper portion forms a shelf

for the arm to rest upon. This is also bent at a right angle so that the elbow is flexed when the arm is resting upon it. Canvas or similar material is sewed around the frame to form a supporting hammock and the entire splint is held in place with three straps. Sufficient gauze and cotton pads are added for comfort. The arm is secured by wrapping bandage around both the arm and the splint.

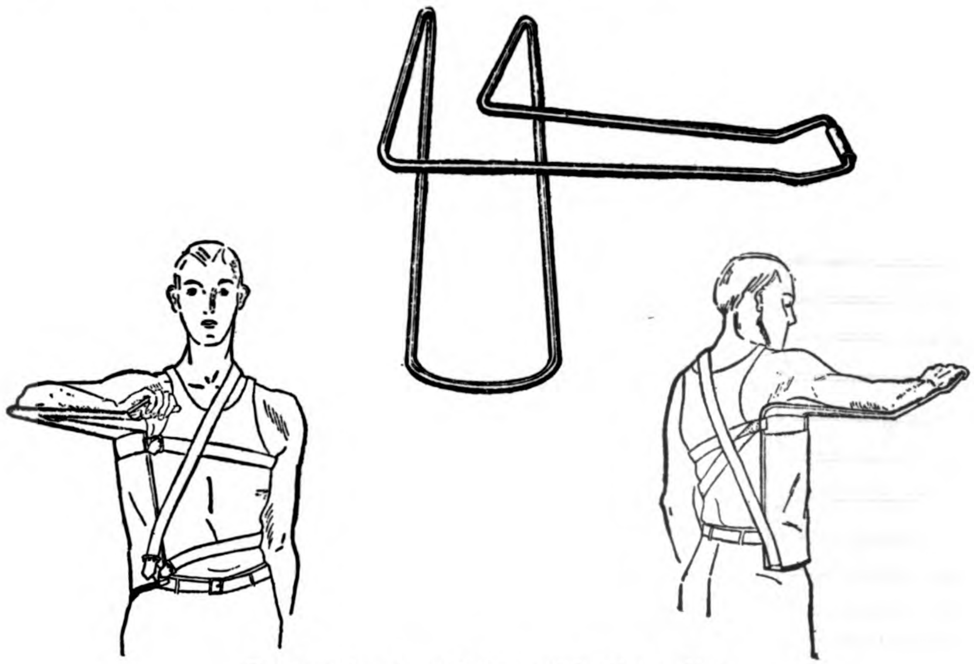


FIGURE 51.—Aeroplane or abduction splint.

136. Clavicular or T-splint.—This splint is used for fractures of the clavicle (collar bone), and resembles the letter **T** as its name implies. The cross bar of the **T** is placed behind the shoulders with the longitudinal bar extending downward along the spinal column. Straps from the ends of the cross bar are passed around the shoulders so as to pull the shoulders upward, outward, and backward. A strap passing around the abdomen is attached to the lower end of the splint to allow for a snug fit.

137. Wooden splints.—Wooden splints are usually made of ½-inch by 4-inch basswood, but boards from discarded fruit crates are also satisfactory. They are mainly used for fractures and other severe injuries of the forearm and hand. The splints are cut into the desired shape and are well padded. Usually two splints are applied, one on the back of the forearm and hand and the other on the inner or palm side. They are held in place with adhesive tape and bandage which should be applied snugly but not too tightly. The forearm can then be suspended in a sling.

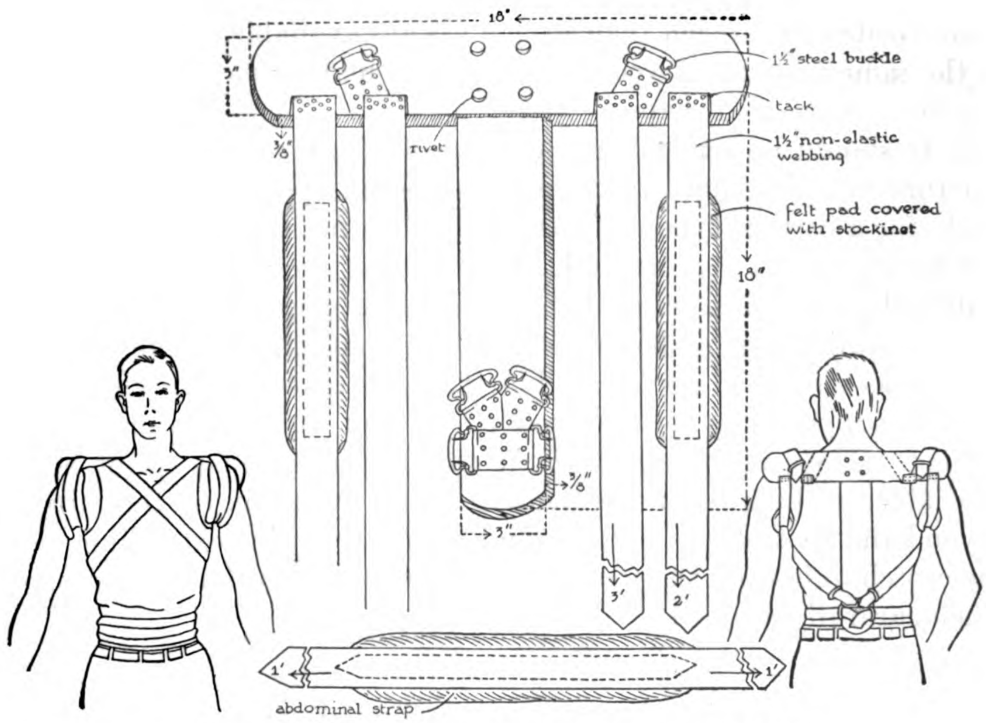


FIGURE 52.—T-splint with straps for fractured clavicle.

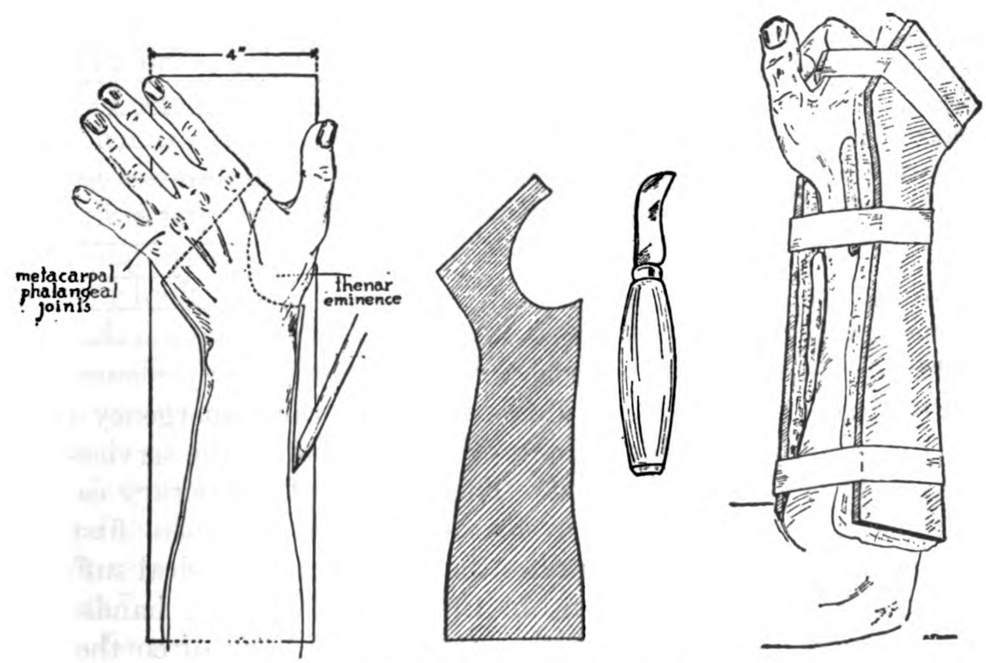


FIGURE 53.—Splinting of lower forearm fractures.

138. Other splints.—*a.* Aluminum splints are more satisfactory than wooden splints but they are not always available. They are used in the same manner as wooden splints and may be molded and cut to any desired size and shape.

b. It should be remembered that to obtain adequate fixation of a fracture one does not always need a special splint which has been made for a certain type of fracture. When nothing else is available any handy article may be used. Examples of these are rifles, swords, scabbards, tent pins, wire, umbrellas, canes, mop or broom handles, sticks, small pieces of board, etc. These may not be quite as satisfactory as a finished appliance, but if care is taken in applying them, enough support can be obtained to prevent further injury to the patient. Thus, in fractures of the thigh, if a Thomas splint is not available, a long splint extending from well above the hip to beyond the foot on the outside, and a shorter splint extending from the crotch to beyond the foot on the inside will afford a good support when carefully applied.

Section IV

EMERGENCY MEDICAL TREATMENT

139. First aid.—*a.* First aid is the temporary emergency treatment given a case of sudden illness or accident before the services of a medical officer can be obtained. This period of temporary care, if intelligently given, will often save a life. In all cases, first aid, properly administered, will reduce the mental and physical suffering and thereby place the patient in the medical officer's hands in a better condition to receive further treatment. Very often the only first aid practicable is the prevention of further injury to the patient by well-meaning but poorly informed onlookers.

b. In rendering first aid there are certain things to be done in all cases of injury or illness. These procedures are—

(1) Send immediately for a medical officer.

(2) Keep bystanders far enough away to permit work without hinderance.

(3) Do not move the patient until the extent of injury is determined. Keep the patient lying in a comfortable position with the head level with the body.

(4) Loosen the patient's clothing about the head, neck, and abdomen.

(5) Examine the patient to determine the nature of the injury or illness, paying particular attention to evidence of hemorrhage, shock, asphyxia, poisonings, fractures, dislocations, burns, and wounds.

(6) Proceed with the first-aid treatment at once, treating serious hemorrhage first, asphyxia next, then shock, and other conditions in the order of their seriousness. Remember never to give an unconscious person any liquids as they may enter the windpipe and strangle him. Keep the patient warm.

c. A soldier giving first aid should do so with evident display of self-assurance and authority born of knowledge, with calmness, and with decision, thereby obtaining the confidence of the patient and of the bystanders.

140. Wounds.—*a.* A wound is a break in the skin or in the mucous membrane of one of the body cavities.

b. The principal kinds of wounds are clean or aseptic wounds, infected or septic wounds, and poisoned wounds.

(1) An *aseptic* wound is one in which no germs have gained access, the best example being a wound made by the surgeon's sterile knife.

(2) A *septic* wound is one in which there has been introduced pus-producing organisms or such organisms as produce tetanus, gas gangrene, or hydrophobia.

(3) *A poisoned* wound is one in which some nonliving poison, as distinguished from bacteria or microorganisms, has been introduced by the agent causing the wound, as for example the stings of insects or the fangs of snakes.

c. Classified as to causative agent or appearance, wounds are—

(1) *Incised* wounds, made by sharp cutting instruments such as knives, razors, and broken glass, the class of wounds commonly known as "cuts."

(2) *Lacerated* wounds, often irregular and torn. They are caused by contact with angular surfaces, by shell fragments, and machinery. These wounds present ragged edges which do not retract much and

which, as a rule, consist of masses of torn tissue, frequently with dirt ground into the tissue.

(3) *Contused* wounds, wounds in which the division of tissue is accompanied by more or less severe crushing. Crushed wounds are more serious than they may appear at first, due to the fact that the dead tissues are an excellent media for the growth of bacteria. This may result, in an infection causing the loss of a part or general blood poisoning.

(4) *Puncture* wounds or *stab* wounds, caused by such penetrating objects as nails, wires, or bullets. They are usually deep and narrow and may be very dangerous if they penetrate deeply enough to seriously injure important organs or cause internal hemorrhage.

d. Infection, severe bleeding, and shock are the principal dangers from any type of wound. Rapid bleeding requires immediate attention. In most cases bleeding is readily controlled. Infection can occur whenever the skin surface is broken, the size or location of the wound not being related to the possibility of infection. A skin puncture with an ordinary pin may cause a serious infection. A wound should never be touched with anything except sterile dressings or instruments; unclean hands, bandages, or instruments may infect a wound that is relatively clean.

141. Treatment of wounds.—*a. Wound in which bleeding is not severe.*—(1) In these cases the chief duty is to keep the wound clean and prevent infection. If an antiseptic is available, apply this gently to the wound and to the skin for an inch around the wound. Allow this to dry well, then apply a clean dressing. If neither antiseptics or dressings are at hand, do not apply a substitute but allow the wound to remain open; bleeding will usually stop in a few minutes.

(2) Do not touch the wound with the hands, mouth, clothing, or any unclean object.

(3) Do not wash the wound with any solutions such as soap or water, as this may carry germs into the wound.

(4) Do not massage or squeeze any wound; you may start severe bleeding or injure the tissue.

(5) Do not attempt to explore the wound with any object or remove blood clots.

(6) Do not reapply antiseptics such as iodine. Never use iodine in the eye or in any body cavity.

b. Wound in which bleeding is severe.—Pressure is the only first-aid method for the control of bleeding. If sterile gauze or bandage material is available, this can be used by direct pressure on the wound and held in place until a dressing is applied or a tourniquet adjusted.

When direct pressure to a wound is not possible, or when the direct pressure does not control the bleeding, apply pressure with the fingers or with a tourniquet between the wound and the heart. At certain places in the body large arteries lie near bones and may be compressed so as to decrease the flow of blood through them. (See par. 143.) Shock is always present with severe bleeding. Do not give any stimulants until the bleeding is controlled. Wounds, especially puncture wounds caused by gun powder or dirty objects, are subject to additional danger from infection by tetanus organisms. Wounds contaminated by soil or street dirt are frequently infected by the organisms of gas gangrene. Serum containing antitoxin is always available against tetanus or gas infection.

142. Miscellaneous wounds.—*a. Snake bites.*—(1) All snake bites are not poisonous. By inspection of the wound one can sometimes tell if a person was bitten by a poisonous or nonpoisonous snake. In poisonous snakes the teeth are arranged in two rows, with a fang on each side, outside of the teeth near the point of the jaw. In nonpoisonous snakes there are four rows of teeth without fangs. The venom of poisonous snakes differs in its action. The poisonous constituents of the venom are neurotoxin, a nerve poison; hemorrhagin, which injures the lining of the blood vessels so that an escape of blood occurs into the surrounding tissue; and hemolysin, which destroys red blood cells. Poisonous snakes are classified as viperine and colubrine. The viperine snakes are those whose venom is made up principally of hemorrhagin and to this group belong the rattlesnake, copperhead, water moccasin, and viper. The colubrine snakes are those whose venom is made up principally of neurotoxin, and to this group belong the cobra and coral snake.

(2) The symptoms of colubrine poisoning are not marked; there may be severe pain and some tenderness, swelling, and discoloration at the site of the bite. In 1 to 2 hours, however, the patient begins to feel tired and drowsy and has some nausea and vomiting. Paralysis generally follows, affecting first the extremities and then becoming generalized, finally affecting respiration and producing death.

(3) The symptoms of viperine poisoning are pain at the seat of the bite with excruciating pain, rapid swelling, and discoloration, some nausea and faintness, rapid, feeble pulse, labored breathing, and in fatal cases death follows within 24 to 48 hours.

(4) The treatment of snake bite should start immediately. A tourniquet should be placed around the limb and just above the bite to increase bleeding and to reduce the amount of absorption of the

venom into the general circulation. A necktie, handkerchief, or bandage may be used as a tourniquet and should be tight enough to prevent the flow of blood back through the veins but not tight enough to prevent the flow of blood in the arteries. A cross incision should then be made over each fang mark, and preferably one to connect the two fang punctures, about a quarter to one-half inch deep to insure free bleeding. Suction should then be applied for at least one-half hour, either by glass breast pump or by heating a bottle and applying its mouth tightly over the wound. The cooling bottle will produce considerable suction. The patient should be kept quiet. Antivenom is now available which neutralizes neurotoxin and hemorrhagin. These are injected hypodermically or intravenously and are very effective, but the application of the tourniquet, free bleeding, and suction are of far greater value if applied immediately.

b. Insect bites and stings.—(1) The bites or stings produced by mosquitoes, fleas, and bees usually require little treatment. The application of Calomine lotion is soothing and 2 percent phenol may be added to this lotion in cases of extreme irritation. If the sting of the insect is left in the skin, it should be removed by a pair of small forceps. The poison from these insects is chiefly acid, and the local application of some alkali such as baking soda, solution of ammonia, or washing soda affords relief.

(2) The bites or stings of the more poisonous spiders, centipedes, tarantulas, or scorpions require prompt treatment. The general treatment is similar to snake bites, that is, the application of a tourniquet, cross incision with free bleeding, suction, and treatment of shock if present. Local treatment of the bite with fuming nitric acid or cautery is recommended.

c. Bites of rabid animals or those suspected of being rabid.—It is very important to catch the animal uninjured and place it in quarantine. Under no circumstances should it be killed as it is only after a period of observation that one can determine if the animal is rabid. The wound should be cauterized with fuming nitric acid and neutralized with sodium hydrate solution 1 percent or sodium bicarbonate solution 10 percent. If fuming nitric acid is not available, sterilize the wound by cautery with a red-hot needle. Do not use silver nitrate or phenol as this will precipitate by coagulation the albumin in the tissues, producing anaerobic conditions necessary for the growth of infective organisms. Apply a dry dressing.

d. Human bites.—Human bites are always more or less poisonous from the presence of bacteria constantly found on the teeth and other

parts of the mouth. A human bite is potentially a very serious bite and fatal infection can result. These wounds should be thoroughly disinfected and wet antiseptic dressing applied.

143. Hemorrhage.—*a. General.*—Hemorrhage or bleeding is the escape of blood from the blood vessel due to a break in the walls. Hemorrhage is spoken of as arterial, venous, or capillary, depending upon whether the escape of blood is from arteries, veins, or capillaries.

b. Arrest.—Nature attempts to arrest hemorrhage by the clotting of blood forming a plug at the point of bleeding. In the average healthy person it takes from 3 to 5 minutes for the blood to clot. This clot of blood which arrests the hemorrhage eventually contracts and permanently plugs the break in the vessel wall if allowed to remain undisturbed. We can assist nature in arresting hemorrhage by elevation of the bleeding part, thus decreasing the pressure of the blood at the point of hemorrhage; by keeping the patient at complete rest so that the blood clot at the point of bleeding will not be disturbed; by the application of heat or cold, which tends to cause the blood vessel wall to contract, and by the use of pressure to close the bleeding vessel. In no case give stimulants in hemorrhage, as they increase the blood pressure and tend to cause the dislodgement of the clot at the bleeding point.

c. Types.—(1) *Capillary hemorrhage.*—In this condition there is a steady oozing of blood from all over the wounded surface. Capillary hemorrhage is treated by the elevation of the part, the application of either very hot or very cold water and the application of uniform pressure by means of a gauze compress and bandage to the part involved. Nosebleed is an example of capillary hemorrhage. The treatment of nosebleed consists of placing the patient in a sitting position, the removal of any constricting clothing about the neck and the application of cold to the back of the neck which causes a reflex contraction of the blood vessels of the nose. If these measures fail place a roll of paper under the upper lip between it and the gum and in severe bleeding pack the nostril with some sort of soft material such as cotton, linen, or lint, gently forcing this well back into the nose.

(2) *Venous hemorrhage.*—In this condition there is a rapid flow of dark blood, a welling up as it were, without any spurting. Venous hemorrhage is treated by the elevation of the part, and the application of direct pressure over the wound with a sterile compress or bandage. This is usually sufficient. If venous hemorrhage should occur from an extremity, the limb should be bandaged from toes or

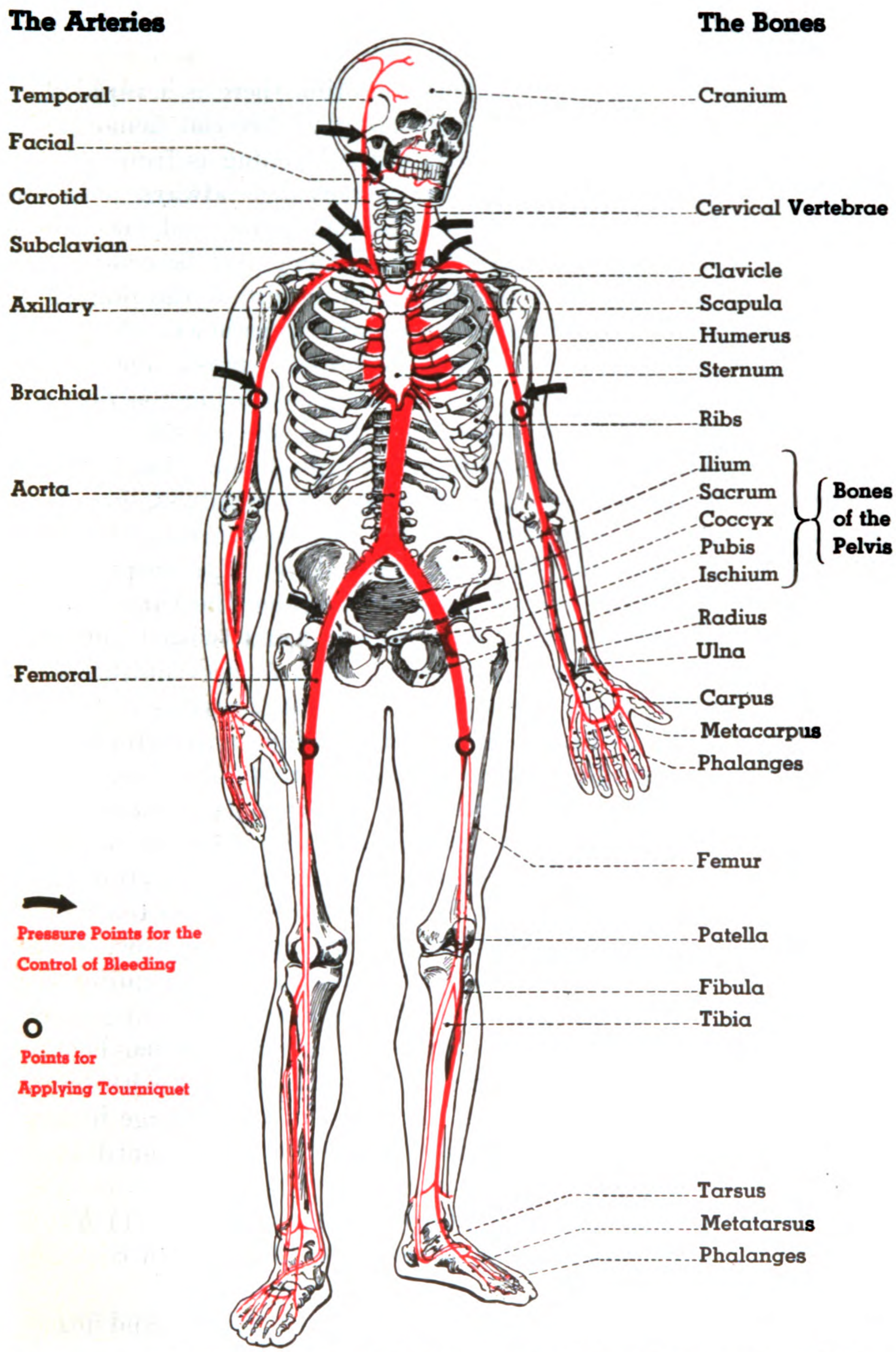


FIGURE 54.—American Red Cross first-aid chart, showing skeleton, large arteries, and points of digital pressure.

fingers up to the bleeding point in addition to pressure over the point of hemorrhage. A common location for severe venous hemorrhage is from varicose veins of the legs.

(3) *Arterial hemorrhage.*—In this condition there is a rapid flow of bright red blood which escapes in spurts. Arterial hemorrhage demands prompt measures, especially if the bleeding is from a large artery. Pressure to control arterial hemorrhage always must be applied at some point between the bleeding point and the heart, preferably, at a point where the bleeding artery may be compressed against bone. Pressure may be applied by means of the finger, by means of compress, or by the application of a tourniquet. A tourniquet is a constricting band, and there are various kinds. The principle of all tourniquets is a pad over the artery to bring the pressure on the artery and take it off the veins, a band around the limb and over the pad, and some means of tightening the band. The common improvised tourniquet is the so-called Spanish windlass, in which any smooth, hard object, such as a stone, a cork, or a roller bandage is used as a compress; for the band, a handkerchief, a suspender, a waist belt, or a bandage may be used. To tighten the band a stick, bayonet, or scabbard is passed under the band and twisted until the bleeding ceases, and the ends tied to the limb to prevent the band from becoming untwisted. Applying a tourniquet may be a dangerous procedure and should not be used if bleeding can be stopped by other means. The dangers of a tourniquet are that if applied tightly enough to control arterial hemorrhage it will cause pain and swelling of the limb, and if left on long enough may cause gangrene or death of the part below the constricting band. It should therefore be watched and released at about half-hour intervals. The tourniquet itself should be at least an inch wide, for if it is too narrow, it will cut off the entire blood supply to the injured part and require very frequent removal. If on loosening the tourniquet, bleeding starts again, tighten it up. Never cover a tourniquet with a bandage or splint, as it may be forgotten. Shock is always present with severe hemorrhage and immediately after the arrest of hemorrhage it must be treated. When the bleeding has stopped, and not until then, should stimulants be given.

d. Pressure points in treatment of arterial hemorrhage.—(1) *Bleeding from the scalp.*—Apply pressure over the wound with compress and bandage.

(2) *Bleeding from the lips.*—Grasp lips between thumb and fingers on each side of the wound, as the arteries to the lips come from both sides.

(3) *Bleeding from other parts of the face.*—Apply digital pressure on the facial artery against the lower jaw midway between the ear and chin where its pulsations can be felt.

(4) *Bleeding from the neck.*—Apply digital pressure with the thumb on the carotid artery against the vertebrae.

(5) *Bleeding from the armpit.*—Place a compress in the armpit and bind the arm tightly to the side. If this fails compress the subclavian artery behind the clavicle between the thumb and first rib, or compress it with a key, the handle of which has been padded.

(6) *Bleeding from an arm, forearm, or hand.*—Apply pressure on the brachial artery on the inner side of the biceps and then apply a tourniquet a little higher up. In case of hemorrhage in the forearm a pad may be placed in the bend of the elbow and the forearm forcibly flexed on the arm. In case of hemorrhage from the palm, either of these two methods may be used, or a large firm compress may be placed in the hand with the fingers very tightly closed over it and bandaged in place.

(7) *Bleeding from the thigh, leg, or foot.*—Apply pressure on the femoral artery against the head of the femur just below the middle of the groin with both thumbs, then apply a tourniquet to replace the thumbs. In case the hemorrhage is in the leg or foot, place a pad behind the knee, flex the leg forcibly and tie it in that position. In the foot when bleeding is from the dorsal surface apply pressure on the anterior tibial artery at the instep. In the foot when the bleeding is from the plantar surface apply pressure on the posterior tibial artery behind the internal malleolus.

(8) *Hemorrhage from the stomach.*—The vomited blood is usually dark in color and may be mixed with food. It always should be remembered that vomited blood does not necessarily indicate hemorrhage from the stomach; blood coming from the back of the nose and throat may have been swallowed, and inquiry should be made to find out if there has been any nosebleed. The treatment consists of keeping the patient quiet and applying an ice bag over the stomach.

(9) *Hemorrhage from the lungs.*—May result from wounds of the lungs, but more often is due to disease of these organs. The patient is usually seized by a fit of coughing and spits up bright red, frothy blood. The treatment consists in keeping the patient perfectly quiet and applying an ice bag over the chest.

(10) *Hemorrhage from the bowels.*—This is bright red if the hemorrhage is recent and if old the stools will be black and tarry in color. Cancer and hemorrhoids are the most common causes of blood in the

stools. If recent hemorrhage, keep the patient quiet and apply an ice bag over the abdomen.

144. **Shock.**—*a.* Shock is a profound depression of all physical and mental processes usually resulting from injury or severe bleeding, but may be caused by exposure, fatigue, hunger, or extreme emotion. Some degree of shock follows all injuries; it may be slight, lasting only a few minutes, or it may be prolonged and end fatally. If an injury of any type is severe, it can safely be assumed that a corresponding degree of shock will be present. Even if evidence of shock has not appeared after severe injury, it is well to anticipate it and prevent it by instituting shock treatment.

b. A person suffering from severe shock lies in a drowsy condition, with the limbs limp, but generally is not totally unconscious. The skin is pale and cold; the temperature subnormal; the pulse feeble, fluttering and rapid, and may be irregular and barely perceptible; the respirations are shallow and sighing; and the pupils are generally dilated. The sensibility of a patient in shock is lowered and pain is not felt as acutely as in a normal condition. If shock does not result in immediate death a condition known as reaction sets in. At first there is usually vomiting, then a gradual return of the color of the skin, with a rise in body temperature, stronger pulse and improved respiration. The patient then often falls into a sound sleep.

c. Concealed hemorrhage resembles shock very closely and must be kept in mind in all cases of severe shock.

d. The treatment of shock requires heat, correction of position of the body, and stimulants. The arrest of hemorrhage, if severe, is of prime importance.

e. Heat applied to the body of an injured person is most important both in preventing and in treating shock. All types of additional clothing may be used; external heat with hot water bottles, hot bricks, or pads may be used freely, keeping in mind that it is easy to burn a person who is in shock. Rubbing of the limbs is of doubtful value. In examining the person remove no more of the clothing than is necessary and replace it immediately when through.

f. The position of the patient will greatly affect the blood supply to the vital organs. Lay the patient on his back with the head low. This can best be done by raising the body so that the head is lower than the rest of the body. If a fracture is present, immobilization of the fractured part where the patient lies is of paramount importance.

g. Stimulants should be used only with conscious patients in the absence of bleeding, skull fracture, apoplexy, or sunstroke. Warmth may be applied internally by hot drinks such as coffee or hot beef

tea in small amounts given frequently, and hot enemas, such as 2 pints of hot saline solution or hot water. Stimulants may be used by mouth as a teaspoonful of aromatic spirits of ammonia in a glass of hot water, hot coffee, hot tea, hot beef broth, or plain hot water. If a patient is unconscious, inhalation of smelling salts or ordinary water of ammonia is of value.

h. The most important treatment in electrical shock is artificial respiration, which should be continued for at least 4 hours in all cases. Shocked patients who have resumed breathing, often later stop breathing and they should be watched closely for hours after the treatment.

145. Asphyxia.—*a. General.*—Asphyxia is the condition where respiration or breathing has ceased. This condition occurs most frequently in drowning, electrical shock, or gas poisoning. The treatment is to first remove the cause or remove the patient from the cause; then give artificial respiration; later, treat for shock.

b. Artificial respiration.—The prone pressure, or Schafer method, is the safest and most effective method of artificial respiration. As soon as the person is rescued, the mouth should be forced open and any foreign substances such as gum, false teeth, or food removed. As every minute is valuable, begin actual resuscitation without delay. The standard technique is as follows:

(1) Lay the patient on his stomach so that his face is free for breathing. One of his arms should be extended over his head, the other bent at the elbow so that his face can be turned outward and rested upon his hand.

(2) Kneel astride the patient's thighs, knees placed at such distance from the hips as will allow exertion of pressure on lower ribs as described below. Place palms of hands on the small of the back with fingers on the lower ribs, little finger just touching the lowest rib, thumbs and fingers in natural position and tips of fingers out of sight just around the sides of the chest wall.

(3) With arms held straight, swing forward slowly so that the weight of the body is gradually brought to bear upon the patient. Do not bend the elbows. This operation should take about 2 seconds.

(4) Now immediately swing backward so as to remove all pressure completely and suddenly.

(5) After about 2 seconds repeat the operation. The movement of compression and release should take about 4 or 5 seconds; this should be done at the rate of about 12 to 15 respirations per minute.

(6) Continue the operation without interruption until natural breathing is restored or until a medical officer declares the patient

dead. Remember, many patients have died because artificial respiration has been stopped too soon. Always continue the operation for 4 hours or longer.

(7) Aside from resuscitation, the most valuable aid that can be rendered is keeping the patient warm. After artificial respiration has been started, have an assistant loosen the clothing and wrap the patient in any clothing that is available. Use hot bricks, heaters, or similar means, but be sure the patient is not burned.

(8) When the patient revives, he should be kept lying down and not allowed to stand or sit up; thus preventing undue strain on the heart. Stimulants such as hot coffee or tea can be given provided the patient is conscious.

(9) At times, a patient, after temporary recovery of respiration, stops breathing again; artificial respiration should be resumed at once.

(10) Due to the length of time this operation may be kept up, one or more operators may be necessary. A change of operators can be made without loss of rhythm of respiration. The great danger is stopping artificial respiration prematurely. In many cases breathing has been established after 3 or 4 hours of artificial respiration, and there are instances where normal breathing has been reestablished after 8 hours.

c. Treatment for a person apparently drowned.—Begin immediately to loosen the clothing about the neck, chest, and abdomen. With a handkerchief or towel, gently swab out the mouth and throat to remove mud or mucus. Turn the patient over, face downward, place the hands under the abdomen, one on either side, and lift the patient in order to drain the lungs and stomach; then with a large roll of clothing under the abdomen, and by making firm pressure upon the loins, continue the effort to expel the water from the lungs and stomach. If the individual then does not breathe, proceed immediately with artificial respiration.

d. Treatment for a person in electrical shock.—The rescue of a person from a live wire is always dangerous. If the switch is near, turn the current off, but lose no time in looking for the switch. Use a dry stick, dry clothing, dry rope, or other dry nonconductor in removing the victim from the wire. Start artificial respiration immediately. Do not regard early stiffening as a sign of death; keep up the artificial respiration for several hours.

e. Treatment for asphyxiation from poisonous gases.—Illuminating gas and the exhaust gases from gasoline engines are the most common causes of gas poisoning. Here again, the rescue is dangerous.

The first thing after the rescue is to get the patient into the fresh air. This does not mean cold air. The fresh air of a warm room is desirable. If breathing has stopped or is weak or irregular, start artificial respiration. Oxygen is an aid to these patients, but does not take the place of artificial respiration.

f. Treatment of other causes of asphyxia.—Asphyxia from hanging, choking, blows on the head and abdomen, or burial in a cave-in are handled in a similar manner.

146. Unconsciousness.—*a. General.*—(1) To treat a case of unconsciousness is one of the most difficult things that may fall to the lot of the first-aid man. There are numerous causes for unconsciousness and in order to properly treat an unconscious person, the cause must be discovered. Frequently it is impossible to determine the cause, and treatment must be general. Lay the patient on his back with the head and shoulders slightly raised; apply cold cloths or an ice pack to the head; insist on absolute quiet; do not move the patient unless urgent and then do so very carefully; have sufficient cover to keep patient warm; and use no stimulants until the patient's condition permits.

(2) In all cases of unconsciousness send for the medical officer immediately. In examining an unconscious patient, look carefully for the cessation of breathing and for symptoms of poisoning, bleeding, or sunstroke, as special treatment for these conditions must be given at once.

b. Fainting.—Is due to too little blood in the brain and is caused by mental impressions, exhaustion, heat, bleeding, overcrowded rooms, etc. There is sudden unconsciousness, pallor, cool moist skin, weak pulse, shallow breathing, and dilated pupils. The treatment is to lay the patient flat on his back with head low and legs raised, sprinkle cold water on the face and hold ammonia or smelling salts near the nostril. Get patient out of a crowded area and into fresh air.

c. Epilepsy or fits.—In this condition there may be fits with insensibility, or a mere momentary unconsciousness with slight muscular twitching, but in which the patient does not fall. In severe forms the patient cries out in a pecular manner and falls in a fit; at first the entire body is rigid, then there are general convulsions with jerking of the limbs, contortion of the face and foaming at the mouth. These convulsions are followed by deep stupor which passes off into a deep sleep. Often there is involuntary evacuation of the bowel and bladder and the patient bites his tongue. There is no treatment which will stop the fit or control it; all that can be done is to prevent the patient from hurting himself and to make him as comfortable as possible. Do not attempt to hold the patient but twist a handkerchief,

passing it between his jaws, and tie it over the back of his neck until after the fit to prevent the tongue being bitten. After the fit is over let the patient sleep as long as he will. In the military service one must be on the lookout for men feigning epileptic fits in order to obtain a discharge. These feigned attacks usually occur at night, the man does not fall so that he hurts himself, he does not bite his tongue, he flinches when his eyeball is touched and the pupils are not dilated. The opposite is true of the epileptic and in addition there may be involuntary evacuation of the bowels and bladder.

d. Concussion.—Concussion of the brain is a condition present when we say a man has been "knocked senseless" or "stunned." It is a jarring and shaking of the brain due to blows or falls. The symptoms are unconsciousness, pallor of the face, breathing so quiet and shallow that it can hardly be detected. Fluttering pulse, pupils equal and usually contracted. The treatment consists of rest in a dark, quiet room; warmth externally, aromatic spirits of ammonia internally, or by inhalation if there is depression.

e. Compression of the brain and apoplexy.—Pressure on the brain is usualy due either to a piece of bone broken from the skull or to blood from a torn vessel which has escaped inside the cranium and, as it cannot get out, must compress the brain. This compression prevents certain parts of the brain from working. When the bleeding is the result of injury, the condition is called simply compression of the brain; when it is the result of the bursting of a diseased vessel without any violence, it is called apoplexy. The result and the symptoms are the same. The symptoms of compression are profound unconsciousness; loud, snoring breathing; slow pulse; pupils usually unequal and not reacting to light, and paralysis on one side of the body. If the symptoms are due to a piece of broken bone, the symptoms come on immediately after the injury, while if it is due to bleeding they may come on later and gradually. The treatment of both conditions consists of keeping the patient quiet, at rest in a comfortable position, and applying cold compresses to the head during the acute stage. Do not administer any stimulants.

f. Hysterical unconsciousness.—Hysteria is a disease of the nervous system accompanied by loss of control over the emotions and is manifested in a great variety of ways. It may be accompanied by convulsions. The patient usually has an attack of laughing or crying and gradually "works himself up" to such an extent that he has a convulsion. He appears to be unconscious but in falling always picks out some soft chair or spot to fall upon, being careful not to injure himself. The patient is to be treated with firmness. He

usually craves sympathy and this is the worse form of treatment that can be given. Leave him alone, being sure to watch that no harm comes to him.

g. Uremia or the insensibility of Bright's disease.—The insensibility of Bright's disease is really an acute poisoning from the retention of the waste products which the diseased kidneys are not able to eliminate. The unconsciousness is often attended with delirium and convulsions. The pupils are contracted, the pulse is slow, there is a peculiar odor to the breath, and the breathing is loud and snoring. The distinguishing features are the history of Bright's disease, the waxy color of the skin, sometimes dropsy, abnormal urine (albumen, casts, etc.) and ordinarily the absence of paralysis. Emergency treatment consists in applying cold cloths to the head and hot packs or mustard poultice to the back.

h. Unconsciousness caused by acute alcoholism.—The use of alcohol, if carried to excess, produces a condition of unconsciousness which is very likely to be confounded with other similar conditions. Too great care cannot be taken in examining these cases thoroughly, as mistakes are of frequent occurrence, and cases of fractured skull or apoplexy often are pronounced as alcoholism. The patient may have been drinking and had a stroke of apoplexy, or may, in falling, have fractured his skull. If there is the least doubt, it is better to give the patient the benefit of the doubt than to run any risks. A person suffering from alcoholic coma lies in a stupor but usually may be partially aroused and made to answer questions. The face is flushed, the pulse is first full and rapid, then feeble and slow, and respirations are deep. The pupils are usually dilated and the breath has the heavy odor of alcohol. Ordinary intoxication rarely requires any treatment but rest and sleep. If the patient is in an exhausted state, it is well to wash out the stomach and cover him warmly and apply heat to the extremities. If the pulse is weak, stimulants should be given. The use of strong coffee by rectum is often of great value if the patient will not take anything by mouth. One can determine by the Bogan's test the amount of alcohol in the circulating blood or urine if the patient is in the hospital, and the urine should be saved for examination.

147. Injuries due to heat.—Injuries due to heat are classified as *general*, which embraces heat cramps, sunstroke, and heat exhaustion, and *local*, which includes burns and scalds.

a. Heat cramps.—Heat cramps are painful, spasmodic contractions of muscles, usually of the abdomen and extremities and are caused by exposure to heat and conditions causing muscular fatigue. The

condition is brought about by the excessive loss of body fluids and salts. This is the mildest form of generalized body injury from heat, and the treatment is essentially the same as that for heat exhaustion.

b. Sunstroke and heat exhaustion.—Both conditions are caused by excessive heat, but they differ in their symptoms and treatment.

(1) *Sunstroke.*—(*a*) This is a very dangerous condition and is caused by the direct exposure to the rays of the sun, especially when the air is moist. Exhaustion and improper clothing are contributing factors, as they prevent the proper elimination of heat from the body surface. This condition is apt to occur most frequently on forced marches with the men in close formation, on a hot, sultry day.

(*b*) The symptoms are headache, dizziness, irritability, frequent desire to urinate, and seeing things red or purple. Examination reveals an intensely hot and dry skin; a rapid, full pulse; high temperature, often ranging from 107° to 110°. Unconsciousness usually results and the body becomes relaxed. Convulsions sometimes occur.

(*c*) Treatment has for its object the rapid reduction in temperature and the restablishment of water balance and of the salts in the body. The patient should be brought to the coolest accessible spot in the shade. The clothing should be removed and cold applied to the head by means of wet cloths, ice bags, or ice. At the same time the body should be cooled by rubbing with ice, and if a tub is available, the body should be immersed in cold water. Wrapping a patient in a sheet and pouring on cold water every few minutes is a good method of treatment. If the body is immersed in a cool bath, massage the limbs and trunk briskly. Observe the patient and do not overtreat. Observe the body temperature every few minutes, and if the skin is hot, repeat the treatment. Continue the treatment until the body temperature is reduced. If a patient is able to swallow, cold, but not iced, water to which table salt has been added in the proportion of one-half teaspoonful to each glass should be given freely. If the patient is unconscious, give copious and frequent enemas of 1,000 cubic centimeters of cool salt water (1 teaspoonful of table salt to each pint of solution). Give enemas every 30 minutes or hourly, depending upon the condition of the patient.

(*d*) Serious results may follow a sunstroke, even when death does not occur. The most common after effects are permanent headaches, paralysis, mental confusion, or even insanity. Moreover, one who has had a sunstroke is more susceptible to the action of the sun.

(2) *Heat exhaustion.*—(*a*) Heat exhaustion is due to the same causes that produce heat cramps and sunstroke. It results from ex-

posure to high temperatures, especially boiler rooms, foundries, bakeries, and similar places. This condition often occurs on the march and while soldiers are standing at attention on a hot day.

(*b*) The warning symptoms are dizziness, often nausea and vomiting, cramping in the muscles, and an uncertain gait. Frequently certain muscles or muscle groups are thrown into violent contraction, which causes excruciating pain. The patient usually falls, the face is pale, the skin is cool and covered with profuse perspiration, breathing is shallow, pulse is weak, and one or several muscles may be in painful contraction. The patient is not unconscious and may be aroused.

(*c*) The treatment of heat exhaustion is to move the patient to the shade, loosen the clothing, keep the head low, and give cool salt water. Coffee or hot tea to which salt has been added is excellent. If severe muscle contractions are present, this condition can be relieved by the immersion of the part in a hot bath, or by the administration of morphine sulfate by hypodermic. On removal to the hospital the patient should be kept quiet in bed, with heat around him if necessary.

(3) *Prophylaxis.*—The prophylaxis of heat cramps, sunstroke, and heat exhaustion is the replacement of loss of salt by taking table salt in drinking water whenever exposed to excessive heat.

c. Burns and scalds.—(1) *General.*—Burns are produced by flame, hot solids, hot fluids, caustics such as strong acids and strong alkalies, wires charged with heavy electric current, sun's rays, and X-ray. Scalds are produced by hot liquids. Burns differ from scalds in that in the former the hairs are removed. The treatment is the same.

(2) *Classification.*—They are classified in degree according to the depth to which the tissues are injured.

(*a*) *First degree.*—The skin is reddened, as in sunburn.

(*b*) *Second degree.*—The skin is blistered, as from contact with boiling water.

(*c*) *Third degree.*—The skin is destroyed or charred, as from contact with flames.

(3) *Symptoms.*—The symptoms of burns are shock, which may be profound, chilly sensation, and pain. The pain may be slight or agonizing.

(4) *Results.*—The results of burns depend more upon the extent of surface affected than upon the depth, a burn of first degree being fatal if two-thirds of the body be affected, and one of second degree if one-third of the body is burned. The chances of recovery are much less in children and elderly people. The danger in the first 24 hours is from shock; after this period, from internal congestion and inflam-

mation, suppression of urine, ulceration of the duodenum, intestinal hemorrhage, and finally from exhaustion, infection, blood poisoning, or tetanus. If entire thicknesses of skin are destroyed, marked deformity from contraction during healing may occur.

(5) *Treatment.*—In all burns the treatment of the patient's general condition is of prime importance. The general principles are always the same, that is, the prevention of shock, the protection of the lesion, relief of pain, and the minimizing of infection.

(*a*) *First degree burns.*—Here the treatment is directed toward the relief of pain, since the skin is unbroken and there is no danger from infection. Pain is relieved by covering the burned surface so that air is excluded. This may be done by the application of tannic acid jelly dressings or by the use of fresh bland oil such as cold cream, vaseline, liquid petrolatum, castor oil, olive oil, or butter. The application of cold water or soda water if immediately applied, is soothing. If the burn is at all serious, oily substances are not to be applied.

(*b*) *Second and third degree burns.*—The most important treatment is the detection and prompt treatment of shock. This takes precedence over all other treatment. The patient should be kept quiet and protected against chilling and any further trauma. Pain should be controlled by the administration of opiates, such as morphine. Elevation of the patient's feet may be necessary. External heat should be supplemented by the administration of hot drinks. Care in removal of clothing, particularly that which is adherent to the burned area, should be employed. The patient should not be transported while in shock.

After recovery from shock, and not until then, attention to the local treatment of the burn can be given. This consists of removal of the clothing about the burned area and of material adherent to the skin by immersing the part in warm water or applying sterile gauze soaked in a solution of epsom salts in the proportion of 2 tablespoonfuls to 1 pint of boiling water. The dressings should be kept moist and warm until further aid is obtained. The wound must be regarded as open, and only sterile dressings applied. Blisters should be left undisturbed.

On arrival of the patient at a hospital, if the burned area is clean a freshly prepared 5 percent aqueous solution of tannic acid should be sprayed on with an atomizer or spray gun every 30 to 60 minutes until a good "tanning has occurred." After a light tan has occurred, the area may be sprayed a few times with an aqueous 10 percent silver nitrate solution. Following this, a 5 percent tannic acid aqueous solution combined with a 10 percent silver nitrate aqueous solution may be applied until a good crust is formed. A heat cradle applied over the burned area will hasten the drying process. The tannic acid

and silver nitrate spray has many advantages over previous treatments. It keeps the burned area aseptic, lessens the possibility of pain and suffering, prevents loss of water from injured tissue and loss of body heat, and serves as a protective covering for the new tissue forming and growing to replace that which has been destroyed. Do not apply iodine or like substances to a burn and do not apply absorbent cotton next to a burn.

(6) *Burns of the eye.*—Emergency treatment consists in flushing the eye with boric acid solution in an attempt to remove any foreign particles. If not available, water will do. Instillation of liberal amounts of liquid albolene or any bland oil such as olive oil, mineral oil, etc., helps protect the eye. The eyelid should then be closed and a bandage applied over the eye. If there is extreme pain, cold compresses on the eyelid will relieve the pain.

(7) *Chemical burns.*—Burns caused by acid or alkalies should be washed with large quantities of water, preferably not too cold, until the chemicals are thoroughly removed. Burns caused by acids should be neutralized with a solution of bicarbonate of soda or ordinary baking soda, and the alkali burns by a weak solution of acetic acid or ordinary vinegar. Phenol and carbolic acid burns should first be washed with alcohol if available. The usual treatment for burns, depending upon the degree, should then be followed.

d. First aid at a fire.—In rendering first aid at a fire the points to be kept in mind are—

(1) Prevent draft from fanning the fire.

(2) Shut all doors and windows.

(3) Have patient lie down and cover all but head with coat, blanket, rug, or the like in an endeavor to smother the fire.

(4) Tie moist cloth of any kind over the mouth to minimize the danger of suffocation.

(5) Remember that air 6 inches from the floor is free from smoke, so when unable to breathe, a rescuer should crawl along the floor with head low, dragging anyone he has rescued behind him.

148. Injuries due to cold.—The effects of cold, like those of heat, may be classified as *general*, as in chilling, or *local*, as in frostbite or chilblain.

a. Cold or chilling.—Prolonged exposure to extreme cold results in a general depression or lowering of the vitality, a gradual chilling of the body, and a congestion of the internal organs. The body and limbs first feel numb and heavy and then become stiff; drowsiness and irresistible desire to sleep take hold of the individual if left alone; unconsciousness readily follows. When found as above, if alive, the

victim should be taken into a cold room, clothing removed, and the body rubbed briskly with sheets or towels wet with cold water. As soon as the stiffness is removed, artificial respiration should be performed; and when the patient is able to swallow, warm drinks should be given. When there are signs of returning consciousness and circulation, the body may be enveloped in blankets and the temperature of the room gradually raised. A frozen person must not be removed to a warm room, as sudden restoration of the circulation gives rise to violent congestions and often to sudden death from the formation of a clot in the blood vessels.

b. Frostbite.—This often occurs in intense cold without one's knowing it, but usually the ears or fingers become painful and cold, and then suddenly numb. The color of the frozen part is white or grayish white. Treatment consists in bringing the frozen part gradually to its normal temperature. The danger of sudden thawing is the congestion and bursting of the capillary walls which have been weakened by freezing. This may result in gangrene or death of the part; therefore the patient should not go into a warm room or near a fire. Rub the part vigorously with wet snow or ice water; never with dry snow, as the temperature of the dry snow may be much below freezing and rubbing with it would aggravate the condition. Do not rub too briskly as it may tear the frozen tissue. When the pain and redness return, use warm water gradually.

c. Chilblain.—Chilblain is a condition of acute or chronic congestion occurring especially in the feet and due to bringing cold feet near the fire too suddenly or merely following exposure to cold, in persons with poor circulation. On the part affected are red spots, more or less swollen, which burn and itch intensely. The treatment consists in stimulating applications such as liniments. Susceptible persons should wear woolen socks as a preventive against chilblain.

149. Fractures.—See section III.

a. Signs.—They are pain and tenderness at the point of the break; partial or complete loss of motion; the broken part is deformed; swelling, and later, discolorations occur; crepitus or grating may be felt, but no attempt should ever be made to elicit this grating; shock is usually present. Remember, all symptoms are not present in every fracture.

b. Treatment of simple.—(1) Splint the patient where he lies. Do not transport or move him about until after some type of splint is placed in position. Improper handling may cause the sharp ends of the bones to injure nerves, cut through vessels, or even pierce the skin, and thus produce a compound fracture. In splinting a simple fracture of an extremity, place the limb in as near the natural posi-

tion as possible by taking hold of the lower part of the limb and pulling gently and steadily. At the same time, an assistant should support the part of the limb on either side of the break in order to steady the bone. Then hold the limb in this nearly normal position until some type of splint can be applied. If a traction splint is not available, improvised splints can be made of any type of rigid or semirigid material. They should be as wide as the limb, always well padded with clothing, and long enough to immobilize the next joint in either direction from the fracture. Pillows, blankets, or even newspapers can be used for padding. Pieces of tin or mesh wire make excellent splints. After the splint is in place it should be tied on rather loosely, as a fractured limb usually swells considerably within 1 or 2 hours. For this reason the limb and the splint must be examined every 20 minutes to be sure that the circulation is not obstructed. Also, if much pain develops, the splints and bandages should be examined.

(2) Following the adjustment of the splint the patient should be placed in a comfortable position and treated for shock. Keep him warm and give him stimulants, such as hot coffee, tea, or beef tea.

c. Treatment of compound.—(1) If severe bleeding is found, check this with pressure between the wound and the heart, then apply a tourniquet. Even where bleeding is not present, it is safe precaution to place a tourniquet loosely around the part, so that if bleeding should start it can be stopped immediately. A tourniquet should never be bound in with the bandages or splint; it may be forgotten and not released when necessary.

(2) Traction splints should be applied to compound fractures of the extremities before the patient is transported.

(3) If the bone is protruding, do not attempt to push it back in place with hands or instruments. Apply iodine, first to the exposed bone, next to the parts of the wound about the bone, and finally to the skin over a wide area about the wound. Place a sterile dressing over the wound.

(4) After the bleeding has been controlled and the wound dressed, a traction splint should be applied.

d. Treatment of skull.—Any person receiving a severe blow on the head or who has been rendered unconscious even for a very short period of time should be kept quiet until examined by a medical officer if at all possible. Head injuries should never be regarded lightly, as frequently the serious symptoms following such an injury do not appear for some hours. Move the patient only in a recumbent position and handle very carefully. Apply cold cloths or an ice bag

to the head. Keep the patient lying down with the head slightly raised. Do not give stimulants. Keep the patient warm.

e. Treatment of spinal.—A patient who has sustained a spinal injury should be placed on his back immediately. A folded coat under the small of the back provides greater comfort for the patient. In transporting a patient with a spinal cord injury, the chief object is to prevent any movement of the patient which will increase the deformity of the vertebral column. The patient should be lifted from the ground like a log. To accomplish this, three persons are necessary, and possibly a fourth to prevent movement of the head, especially in cervical spine injuries. The patient should be placed flat on his back on a rigid support. A stretcher does not supply this rigid support. Flat boards bound together will serve the purpose. Whatever is used, it should be well padded. Another method of moving a patient with spinal injury is to apply splints on both sides, from his armpits to his feet, so as to make the body as rigid as possible, then to work a blanket under him, and, drawing it as tightly as possible, to lift him to the litter on it.

f. Treatment of pelvic.—The pelvis is so strong that bones are broken only by the most severe direct violence. If a severe fracture, the bone spicules may penetrate the bladder. If there is an injury to the bladder the urine will usually contain blood. Fractures of the pelvis should be supported by a swathe pinned tightly about it to afford support. Splints may be applied also on both sides from the axillae to the feet for added support.

g. Treatment of fractured rib.—In this type of fracture the sharp ends of the fractured bones are apt to stick into the lung every time the patient breathes; hence in these cases the patient will often complain of a sharp pain on breathing and there may be a cough, with the spitting of frothy blood. The treatment consists in confining the movement of the fractured chest as much as possible in order to give the broken bone an opportunity to rest and knit. This is done either by strapping the affected side with adhesive tape, or by a circular bandaging of the whole chest.

150. Dislocations and sprains.—*a.* When a bone gets out of place at a joint the condition is called a dislocation. A sprain is an injury or bruise to a joint. In these conditions the pain is usually severe, marked swelling occurs rapidly, and shock is present.

b. Treatment consists in elevation of the part. If an upper extremity, elevate by means of a sling; if the lower extremity, have the patient lie with pillows, coats, or other support under the leg. Apply cold applications to the site of the injury to retard the swelling

and reduce the pain. If shock is severe, apply heat to the body and call a medical officer at once. When in doubt, treat the case as a fracture and apply splints, especially if the patient must be transported. Never attempt to reduce or correct a dislocation, as permanent damage may be done to the joint.

151. Common emergencies.—*a. Foreign bodies in the ear.*—The only safe method is to syringe the ear canal with lukewarm water. In syringing the ear be sure to direct the force of the flow of water along the side of the ear canal and not in the direction of the drum. If the object does not come out, leave the ear alone until it is seen by a medical officer. Never use pins or wire to dislodge these objects, as there is great danger of seriously injuring the ear. Insects in the ear can usually be killed by dropping in a little oil and then washing out the ear.

b. Foreign bodies in the nose.—These usually present no immediate danger. Gentle blowing of the nose may be tried; if unsuccessful, drop in a little olive or mineral oil and consult a medical officer. Any attempt to remove the object with forceps or wire usually causes more swelling and lodges the foreign body more securely. The object can often be dislodged by stoppage of the unaffected nostril and forceful blowing of the nose.

c. Foreign bodies in the eye.—(1) They are of frequent occurrence and are attended by considerable danger. Do not attempt to remove the foreign object with the fingers or to rub the eye. Close the eye for a few minutes until the worst of the irritation is over, then grasp the upper lid lashes and elevate the lid; repeat this process a few times. In many cases the object will be washed out by the tears.

(2) Where the above method fails, a search must be made under the upper lid. To examine under the lid, have the patient look down, place the thumb near the edge of the lid, and then with the other hand raise the lashes. Wipe the object with the corner of sterile gauze or irrigate the eye with water that has been boiled and cooled, using a small rubber ear syringe to direct the stream of water directly into the eye. This is a safe and easy procedure.

(3) If the object is embedded in the eye or lid, or if there is difficulty in attempting to remove the substance, close the eye and apply a small bandage, just sufficient to keep the eye closed, and consult a medical officer as soon as possible. Do not use a knife, toothpick, pin, or any similar object to remove an object from the eye. The eye is easily injured and may be damaged by ill-chosen procedures.

d. Pain in the abdomen.—This may be due to a variety of causes, many of which may be serious. In any case where pain occurs over any part of the abdomen, with nausea and vomiting, and accompanied or followed by pain and tenderness in the lower right part of the abdomen, appendicitis must be suspected. Put these cases to bed at once and call a medical officer. Do not give a cathartic or laxative. Do not give any food, water, or anything by mouth.

152. Poisons.—*a.* The principal point to be remembered in the treatment of poisoning is that poisons, when diluted, are not absorbed as rapidly as when they are in a concentrated form. Clean out the stomach by causing vomiting, or washing; continue the washing until the returned fluid is clear. The following fluids are useful in producing vomiting: Soap suds, salt water, soda water, lukewarm water, or milk, the last especially for corrosive poisons. Give four to seven glassfuls, preferably lukewarm. Tickling the throat with the finger, after drinking of the fluid, will usually induce vomiting. A large dose of Epsom salts may safely be given after the stomach is cleaned out.

b. For carbolic acid (phenol) poisoning, give soap suds with Epsom salts. For the corrosive poisons such as bichloride of mercury, give milk or the whites of eggs.

c. For sleep-inducing drugs, the patient must be kept awake by physical exercise; strong coffee may also be used.

d. For strychnine poisoning, do not give stimulants; keep the patient as quiet as possible; wash the stomach with weak potassium permanganate solution.

e. Most cases of poisoning show signs of shock. Heat is beneficial and artificial respiration may become necessary.

Section V

EMERGENCY DENTAL TREATMENT

153. General.—*a.* In the absence of a dental officer, enlisted men of the medical department, particularly those who have had prac-

tical experience with the dental service, are frequently called upon to treat some of the more common emergencies of a dental character. Such emergency treatment as the medical soldier may be able to render will often diminish pain so that the sufferer may continue on his duties, or, if at night, be assured of rest. Such treatment is necessarily of a temporary nature and usually intended only to keep the patient comfortable, until the services of a dental officer become available. While performing such a service the medical soldier should inspect carefully the appearance of the mucous membrane of the entire mouth. Patients desiring treatment for a particular condition are often unaware of the presence of other existing lesions which may be of grave importance. Any unusual or suspicious condition should be reported as soon as possible to a dental or medical officer for the proper observation, diagnosis, and treatment.

b. Below is a brief description of the principal dental conditions which frequently give rise to pain, and the usual methods employed to cope with such emergencies. These dental diseases or injuries are dental caries, pulpitis, abscesses, gingivitis, vincent's infection, osteitis, and pericoronitis.

154. Dental caries.—*a*. Dental caries, commonly called tooth decay, is a disease of the hard structures of the tooth characterized by the destruction of tooth substance to form localized cavities. The initial stage of dental caries consists of decalcification of the enamel or of the cementum by acids which are confined to particular tooth surfaces. These particular areas are the pits and fissures, and those smooth surfaces of a tooth which are habitually unclean. The acids of dental decay are produced by the action of certain acid-forming bacteria upon food sugars. While heredity, general disease, certain dietary deficiencies (minerals-vitamins), and faulty tooth structure may influence the carious process, the most important factors in the production of dental caries are poor oral hygiene, food impaction and general mouth uncleanliness. Allowing food to remain on the teeth results in the retention of carbohydrate material and the localization of the products of fermentation on the surfaces of a tooth. Once the enamel or the cementum is broken through, additional food is retained in the cavity, the dentin is quickly involved, and if allowed to continue, the cavity will progressively involve the whole tooth. Caries of the enamel is painless, pain not being elicited until the dentin becomes affected. The first symptoms of serious tooth involvement may be only a slight discomfort to thermal changes (usually cold), sweets, acids, or to pressure from the packing of food into the cavity while chewing. When the decayed area starts be-

tween the teeth the cavity may go unnoticed and without pain until the enamel breaks while chewing. When this occurs, it indicates that the enamel has been seriously undermined, and a toothache will soon develop if the condition is not treated within a short period of time. An offending cavity may be found upon inspection in most instances by the aid of an explorer and mouth mirror. When the cavity is not exposed to view, it may frequently be detected by changes in the transparency of the enamel. Occasionally a cavity may be detected only by aid of transillumination or the X-ray.

b. To treat carefully remove all debris and soft decay from the cavity with suitable instruments, and wash with warm water. Isolate the affected tooth with a roll of cotton or gauze, and dry the cavity with small pellets of cotton. Sterilize the cavity with a small pellet of cotton moistened in phenol (excess should be removed by touching against a cotton roll), followed by another pellet of cotton to remove the excess phenol and to dry the cavity. Fill the cavity with a paste made by mixing zinc oxide and eugenol to a fairly thick consistency. This paste hardens within a few hours upon contact with the saliva, and will serve as a temporary filling for several weeks. The patient is instructed not to use the tooth for several hours, and to brush his teeth thoroughly after each meal to remove all adhering food debris. If zinc oxide paste is not available, a small pellet of cotton moistened in eugenol may be placed in the cavity and the remaining portion of the cavity filled with temporary stopping (after softening by heat), or with another pellet of cotton saturated with sandarac varnish, cavity lining, or compound tincture of benzoin. Phenol may be used in place of eugenol as a sedative, but care must be exercised to avoid a burn. Should any phenol come in contact with the surrounding tissues, wipe the area immediately with cotton dipped in alcohol.

155. Pulpitis (toothache).—*a.* The pulp (nerve) is an extremely sensitive organ which reacts readily to any irritation or injury. An inflammation of the dental pulp (pulpitis) gives rise to a characteristic pain, sharp and stabbing. A prominent feature of the condition is that it is intermittent, the patient being entirely free from pain in the periods of remission. At times the pain may be somewhat obscure, the offending tooth being difficult for the patient to locate, as a tooth which is the seat of an inflammed pulp is not sensitive to biting or tapping. It is, however, markedly sensitive to thermal changes, especially cold, and this latter feature may be utilized in efforts to locate the disturbance. This sensitiveness is of a temporary character, occuring only upon the stimulation of cold water,

cold air, ice cream, etc. and subsiding as soon as the irritation is removed. The pain in pulpitis is the result of a hyperemia (increase quantity of blood) in the pulp chamber, which compresses the terminal nerve fibres of the dental pulp against the hard unyielding walls of dentine. Pulpitis is most commonly caused by an invasion of the pulp tissue by bacteria from a carious cavity. A search should be made for the offending tooth, the cavity carefully cleaned of all soft debris and decay, and treatment instituted as outlined above for dental caries.

b. In addition to caries, there are other possible causes of pulpitis. Pain of pulpal origin may arise as the result of a newly inserted filling which is too high, to a loose filling, to an ill-fitting clasp, or to marked food empaction between teeth with loose contacts. When a patient complains of toothache in the absence of caries an effort should be directed toward other possible causes and the condition corrected, if possible.

156. Periapical (alveolar) abscess.—*a. General.*—Deep caries, trauma, or other injury to a tooth may set up a severe irritation, and eventually cause the death of the dental pulp. Sooner or later this mass of dead tissue is subject to attack by suppurative and putrefactive bacteria resulting in the formation of pus and gas. Pressure within the tooth from these enclosed gases forces toxic products through the apical foramina into the surrounding periapical tissues and alveolus, causing irritation and the subsequent infection of these tissues. Periapical abscesses may be acute or chronic in nature, depending upon the infectiveness of the invading organisms and the resistance of the individual.

b. Acute.—(1) An acute alveolar abscess due to the internal pressure from accumulated pus and irritation of the periapical tissues causes most excruciating pain. This pain is of a boring or throbbing character, and increases with movement of the jaw, muscular exertion, or when assuming a recumbent position. The offending tooth is readily located. It appears to be loose, slightly raised in its socket, and extremely sensitive to pressure or to touch. Due to the marked inflammation, adjoining teeth may be somewhat sensitive to pressure. The application of cold water or small chips of ice to the affected tooth will relieve the pain temporarily, while hot water increases the symptoms. In the early stages of an acute alveolar abscess there is no apparent swelling. Later, 24 to 72 hours, the overlying soft tissues are markedly swollen, the edema often involving the tissues of the face. When the pus has found an exit by boring its way through the bone into the soft tissues, the internal pressure is relieved, and the pain ceases.

(2) To relieve the pain caused by an acute alveolar abscess in its early stages, it is essential to establish free drainage through the root canal to allow escape of the accumulated exudate. Generally, the offending tooth will contain a large cavity. All decay and soft debris should be carefully removed and the pulp chamber opened. In these cases the pulp is usually nonvital and an offensive odor and a free flow of pus will be noticed. If it is necessary to use a bur to open the cavity or pulp chamber, the tooth should be held firmly to counteract the pressure of the drill, because of its excessive tenderness. After free access and drainage is established, the cavity is washed with warm water, and packed lightly with a pellet of cotton to prevent the lodgement of food from further blocking the pulp canal. When pus has accumulated in the surrounding tissues, the swollen area within the mouth is palpated with the finger to determine the place of pointing of the abscess. At the point of softening an incision is made with a sharp pointed lancet directly toward the bone in the direction of the apex of the tooth for the evacuation of pus. Pending the development or pointing of an abscess the patient should be kept quiet and at rest. Instructed to frequently use hot saline mouth washes, to drink freely of water, and to apply an ice pack to the face over the affected area. Sedatives may be administered for the relief of pain.

(3) In certain cases all attempts to relieve the pain is futile, and an extraction is the only possible remedy. During the absence of a dental or medical officer such procedure should be undertaken only in extreme emergencies and as a last resort. (See par. 162.)

c. Chronic.—After an acute alveolar abscess has run its course and the acute symptoms have subsided, the condition is known as a chronic alveolar abscess. An abscess of this type usually has a fistulous tract opening onto the surface of the gum tissue (gumboil). However, in certain cases, where the pulp (nerve) has died and the resulting infection is mild in character, nature throws up a wall or sac of granulation tissue at the root apex and the condition is then commonly designated a dental granuloma or blind abscess. A chronic alveolar abscess is as a rule painless and rarely causes sufficient trouble to require emergency treatment. Occasionally they become reinfected, developing acute symptoms, in which case the treatment is the same as just outlined for an acute alveolar abscess.

157. Parietal abscess.—A parietal (lateral) abscess is caused by an infection of the tissues around a tooth whose products of inflammation fail to find an exit to the surface through the gingival crevice.

They may occur on the lateral surfaces of the roots of the teeth in which the pulps and periapical tissues are normal. Infection in these cases arise as a result of some form of irritation at the gingival margin, such as impacted food particles, calculus, broken toothpicks, toothbrush bristles, or other foreign objects. In most instances they appear on the roots of the teeth involved with pyorrhea, particularly at the bifurcation of the roots of molars. The symptoms are similar to that of an acute alveolar abscess. However, the pain is less severe, the swelling less extensive, and definitely localized at the site of the lesion. In treatment, remove the calculus or other foreign body, and probe the gingival crevice with a small blunt instrument until the opening to the pocket is found in order to establish adequate drainage. Gently apply pressure to the overlying gum tissues to aid in the evacuation of the pus, and paint the involved area with 3½ percent iodine in glycerine. Patient is instructed to use a mouth wash, and to keep the affected area free of adherent food debris.

158. Gingivitis.—Gingivitis is a local inflammation of the soft tissues surrounding the necks of the teeth. The gum tissues are swollen, dark red in color, tender to pressure, bleed easily, and the tissue from between the teeth may be lifted readily from their interdental spaces. Dental calculus (tartar) is usually the main source of gingival irritation. Lack of proper oral hygiene, food debris, food impaction, gingival caries, foreign bodies, and faulty dental appliances may also be contributing factors. To reduce the irritation the calculus is carefully removed, and other possible causes corrected. The gingival crevice is thoroughly irrigated with warm saline or antiseptic solution, and the affected parts painted with 3½ percent iodine in glycerine. The patient is advised relative to the importance of oral hygiene and instructed to frequently brush and massage the gums in order to restore their normal tone and resistance.

159. Vincent's infection (trench mouth).—*a.* This disease is an acute, infectious, destructive inflammation of the gingival tissues caused by certain specific anaerobic organisms. It usually begins with a sudden onset, accompanied by fever, malaise, salivation (profuse flow of saliva), mental depression, headache, loss of appetite, and constipation.

b. The gingival margins, particularly between the teeth, present a dirty, grayish, ragged, ulcerative appearance, are extremely painful to touch, and bleed easily. The patient has a characteristic offensive fetid breath, and complains of a constant pain about the teeth and gums which may be so intense as to interfere with sleep

or eating. Ulcerations may not be confined to the gingival tissues alone, but may extend to the mucosa of the lips, cheek, palate, or throat. Most cases of Vincent's infection occur in mouths in which a low standard of hygiene prevails. To improve this condition is an effective means of reducing the infection and raising local tissue resistance. Treatment consists in thoroughly spraying or irrigating the mouth and inaccessible areas with an antiseptic solution, preferably a week peroxide solution, to remove soft deposits and toxic bacterial products from about the teeth and gums margins. Remaining adherent debris and necrossed tissue should be carefully removed by small cotton applicators dipped in peroxide solution. Copious spraying or irrigating of the mouth at this stage aids materially in reducing the infection. If peroxide is used, after this preliminary clean-up or toilet of the oral cavity is accomplished, the excess is removed by spraying with a saline or an alkaline wash. The affected areas are then dried, protected by cotton rolls, and 5 percent chromic acid in distilled water, 1 percent solution of acriviolet (0.5 gm. neutral acriflavine and 0.5 gm. gentian violet in 100 cc. of distilled water), or 10 percent arsphenamin in glycerine is applied directly to the necrossed areas.

c. Home or ward care consists in the constant and frequent use of a mouth wash and gargle. The following mouth washes are applicable:

(1) Equal parts of peroxide of hydrogen and water.

(2) Equal parts of peroxide of hydrogen and 1–1,000 bichloride of mercury. (This should be labeled poisonous and the patient instructed not to swallow the medicament.)

(3) One teaspoonful of sodium perborate dissolved in a glass of hot water. This latter should not be used over long periods of time, as it may cause additional inflammation to the oral mucosa.

(4) Potassium permanganate 1–2,000 solution.

d. Severe cases of Vincent's infection with constitutional symptoms should be hospitalized. The patient should be given a cathartic and placed on a soft diet containing an abundance of fresh fruit juices and vegetables. After the acute symptoms subside, a thorough prophylaxis is indicated, the patient is instructed in the use of the toothbrush, and the treatments continued until the local tissues have regained their normal color, free from irritation and infection.

e. Since Vincent's infection is a communicable disease, the patient is instructed to use his own mess utensils, towels, and toilet articles to prevent spread of the infection. The mess sergeant is informed of the patient's condition in order that proper measures may be in-

stituted to sterilize all eating utensils following use. All Vincent's cases while undergoing treatment should mess at a separate table.

160. Osteitis (painful socket).—This is an extremely painful condition which occasionally follows tooth extraction. It seldom arises until a day or more after an extraction, and it indicates that a normal blood clot has failed to form, leaving the tooth socket empty or partially filled with debris. The socket should be gently irrigated with warm saline or antiseptic solution, and a small piece of plain, Bipp's, or iodoform gauze slightly moistened in eugenol placed lightly into the socket, using care not to exert pressure. The dressing should be changed once or twice daily until relief from the symptoms is obtained.

161. Pericoronitis.—This is an inflammation of the gum tissue around the crown of a partially erupted tooth. It is most commonly associated with the lower third molars (wisdom teeth). The tissue covering the crown is inflamed, swollen, painful, and extremely sensitive to pressure, with associated swelling at the angle of the jaw and lymph node involvement. Frequently the patient complains of a sore throat on the affected side, with difficulty in opening the jaw. Suppuration may or may not be present. Treatment is mainly palliative in character. Thoroughly spray or irrigate the affected area with an antiseptic solution. Gently probe the area beneath the flap and around the crown to evacuate the presence of any free pus should the inflammation be purulent in character, indicating a pericoronal abscess. Spray the area again, and then isolate with cotton rolls or gauze. Dry with air or with large loose pellets of cotton, and carefully insert tincture of iodine under the infected flap by aid of a small probe wrapped tightly with cotton or a Rheims file number 31 or 32. The beaks of cotton pliers may be used to advantage in carrying the medicament to the involved area. Paint the involved tissues with half strength tincture of iodine in glycerine. Patient is instructed to hold hot salt water in the mouth at frequent intervals forcing it back and forth over the affected area, to apply an ice cap to the affected side of the face (if the condition is severe), to keep the mouth clean, and to return daily for treatment until the acute symptoms subside. After preliminary therapy, complete relief may not be obtained until the overlying tissue is removed either by surgery, the electric knife, or cauterization. At times pericoronitis is aggravated by the opposing upper third molar. In these instances an imprint of the tooth may be seen on the inflamed tissue. Grinding the cusps of the offending tooth will help to temporarily relieve the condition.

162. Extraction of teeth.—*a.* In the absence of a dental or medical officer, an extraction should be attempted only in extreme emergencies and as a last resort to alleviate pain, after all other emergency measures have proven unsuccessful. Teeth that are firmly set in the jaw, badly decayed teeth, or broken down roots are difficult to remove, and attempts to remove such teeth will often prove disastrous and aggravate the patient's symptoms. The various teeth have definite extraction movements for their removal which must be rigidly adhered to in order to prevent their breaking or damage to the supporting bony structures. Only those teeth that are extremely painful and definitely loose, indicating no difficulty in removal, should be undertaken by the medical soldier. An extraction is a form of surgery, and all instruments and the hands must be scruplously clean, or serious infection may result.

b. The procedure is as follows:

(1) Thoroughly spray the patient's mouth with salt water.

(2) Examine carefully to be definitely sure of the offending tooth.

(3) Remove all deposits, that is, food debris and calculus, from the involved tooth and those adjacent.

(4) Wash with water and paint the gum margins and overlying tissues with 3½ percent iodine.

(5) Detach the soft tissues from the neck of the tooth to be removed with a suitable instrument (Woodson No. 1) so that they will not be lacerated, and paint again with iodine.

(6) Select suitable forceps.

(7) In applying the forceps to any tooth, one beak is first placed on the lingual side. The tooth is then grasped by slightly closing the forceps, and the instrument is pushed as far as possible under the gum, thereby gaining a firm grasp on the root of the tooth. Care should be exercised not to grasp the gum tissue or the alveolar process with the forceps, as damage to these tissues is a frequent cause of after pain and delay in healing. Do not grasp the crown, as the force of the instrument is liable to cause it to crush, but use only as a guide for placing the beaks on the root of the tooth.

(8) Secure a firm grip on the forceps handles.

(9) Rotate the tooth slightly, or slight lateral movement is applied, according to the shape and number of roots. Rotation of single conical rooted teeth is usually successfully accomplished, while those whose roots are not conical and multirooted teeth require a definite lateral motion, first inward, which is followed by an outward movement. Care should be exercised in not applying too much force laterally, as the tooth may readily break.

(10) After the tooth is loose, apply a pulling force to dislodge from the socket. The extraction of teeth is not a matter of crude force, but governed by exacting, definite movements.

(11) Isolate the area to protect from saliva and allow a normal blood clot to form.

(12) Paint with iodine.

(13) Instruct the patient not to rinse the mouth and to remain quiet for several hours.

c. For postoperative hemorrhage, see paragraph 236*c*.

SECTION VI

EMERGENCY VETERINARY TREATMENT

163. General.—Emergency veterinary treatment implies the initiation of measures for the restoration of animal health. Such measures may be very simple, and may or may not include the use of so-called medicines, but of such importance as to save a life or prevent permanent disability.

164. Recognition of emergency.—The ability to recognize the abnormal condition existing is necessary for probable success in treatment. This entails a thorough knowledge of the normal habits and actions of the horse (see par. 238) and the development of one's powers of observation in order to detect the abnormal condition early.

165. Agents available for simple treatment.—Ropes, slings, and similar devices are used for the movement, restraint, and support of disabled animals. Other agents used in treatment include hot and

cold water, ice, soap, protective clothing, bandages, and simple drugs largely of a stimulating or antiseptic nature.

166. Bandages.—*a. Roller.*—Roller bandages consist of long strips of various lengths and widths and may be obtained in an assortment of materials. For convenience of application, they are wound into snug rolls. Roller bandages are used particularly on the legs from the knee and hock down to and including the foot. The greatest danger in applying a roller bandage to the leg above the foot lies in getting it so tight all over, or at one or more points, that the underlying blood vessels are compressed, and circulation of the blood is interfered with. This is particularly true when horses are worked in bandages, or the inelastic type of material is used. The following general rules are applicable for all roller bandages:

(1) Use one hand to hold and direct the roll; the other to keep each lap smooth and to hold the turn when changing direction or taking up slack.

(2) Wrap snugly enough to exert the desired amount of pressure and prevent slipping, but be careful not to shut off circulation by too much pressure.

(3) Secure the end with the same pressure used in wrapping.

(4) Always fasten the bandage on the outside of the leg.

(5) Bandages may be secured as follows:

(*a*) Pass the tapes on the end around the last wrap in opposite directions and tie in a bowknot.

(*b*) Slit the last 12 or 14 inches of the gauze or muslin with the scissors. Tie the two slits with a straight knot and proceed as with the tapes.

(*c*) Double back the last 20 inches of the gauze or muslin bandage around the last wrap and tie that end with the folded end.

(*d*) Secure the bandage with safety pins by pinning the end to the wrap underneath.

(*e*) Leave a bight protruding at the start and tie the end to this bight.

(6) Roller bandages are made of gauze, muslin, flannel, and knitted elastic material. Aside from the bias cut muslin and canton flannel bandages in the stable sergeant's veterinary set, the most commonly used bandage is the derby bandage. The latter is not an article of issue but is often purchased for polo and horse show use.

b. Foot.—The foot is bandaged as follows: The 5-inch muslin bandage cut on the bias is most suitable for bandaging the foot. Hold the foot in the same manner that a horseshoer holds it when shoeing. Hold out a bight 12 inches long, make one complete turn around the foot one-

half inch below the coronet, and take a half turn around the bight, holding the end of the bight in the left hand and the roll in the right. After drawing up snugly, take another turn around the foot in the opposite direction to the first. Complete by another half turn and pull around the bight. Make these half turns around the bight come over the quarter. Continue the turns around the foot by working down toward the toe and back so as to cover the whole foot. Take a half turn around the bight each time and draw the bandage tight before starting a new wrap. Secure by tying the end to the bight.

c. Eye.—In certain traumatic injuries to the eye it is necessary to apply wet antiseptic compresses. This form of treatment also produces very good results by virtue of excluding light. This bandage may be made from a burlap sack. Hold the material up to the head and mark the place to cut openings for the ears and the sound eye. Lay it on a flat surface and cut out elliptical holes large enough for the base of each ear. Cut a circular hole for the sound eye about 6 inches in diameter. Then cut four strips, each about 8 inches long on each lower border. Sew a gauze compress on the inside so that it comes over the injured eye. Apply the bandage by laying it on the face and forehead, placing the ears in their proper holes, and adjusting it so that the sound eye is in the center of the hole cut for that purpose. Tie the four pairs of strips underneath the jaws. (See fig. 55.)

d. Many-tailed.—The many-tailed type of bandage is used principally on the knee and hock. It acts only as a protection and support for a compress held in place by a loosely applied roller bandage. (See fig. 55.)

e. Maltese cross.—The maltese cross bandage is an accessory foot bandage used as a protection for a compress which has first been secured by a roller bandage. (See fig. 55.)

f. Foot pouch.—The foot pouch is an accessory bandage cut from the corner of a burlap sack and has the same function as the maltese cross. (See fig. 55.)

(1) Lay a gunnysack down on the floor with the open end toward the operator. Starting at the open end and 2 inches inside the left hand seam, cut straight down toward the bottom and parallel to the seam until about 8 or 10 inches from the bottom of the sack. Repeat this cut 2 inches inside the right hand seam. Join these two by cutting across the sack parallel to and 8 to 10 inches above the bottom edge. This leaves the bottom 8 to 10 inches of the sack intact with long strips, one on each side. Grasp the bottom left hand corner with the left hand and the bottom right hand corner with the right hand and invert the sack by pushing the right corner into the left corner. This

leaves the sack shaped similar to a bonnet with both strings together on the left side. Cut a hole 1 inch in diameter in the corner diagonally across from the corner to which the strips are attached. Tie the strips together with a simple knot and pass through the hole just cut, in opposite directions. This serves as a puckering string for the pouch.

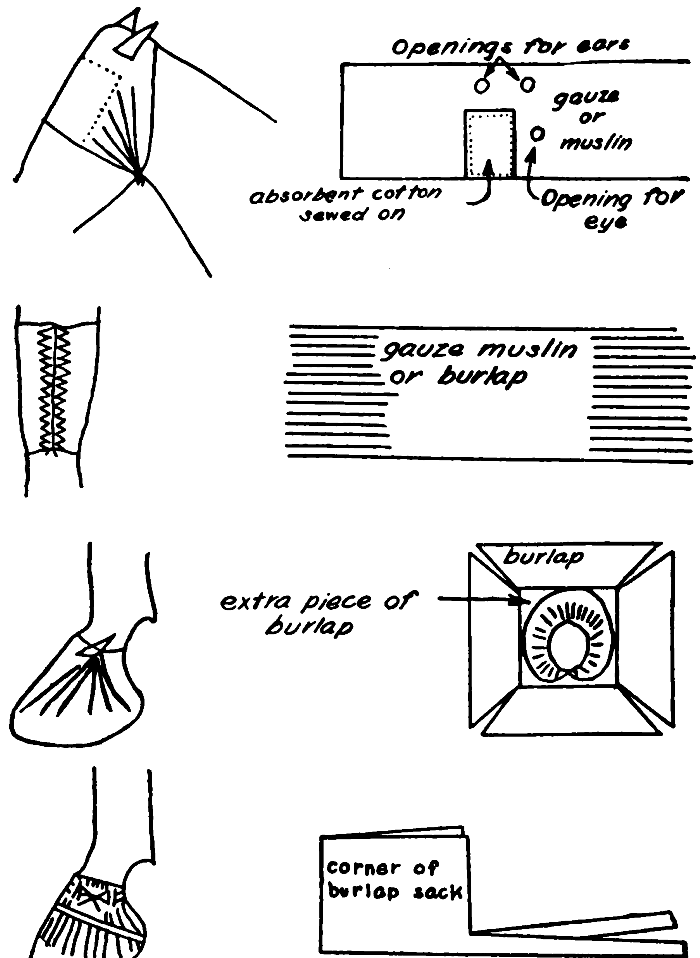


FIGURE 55.—Bandages.

(2) Place on the foot by inserting the toe into the corner opposite the one in which a hole was cut for the strips to pass through. Pull up snugly around the foot, wrap the loose ends around the coronet and pastern. Secure by passing the strips in opposite directions around the coronet and tieing over the wall below the coronet.

167. Wounds.—*a. General.*—(1) *Classification.*—Wounds may, for the purpose of description, be divided into—

Incised wounds, or cuts.
Lacerated wounds, or tears.
Punctured wounds, or holes.

(2) *Cleanliness.*—The great fundamental in the successful treatment of wounds may be summed up in the word cleanliness. Cleanliness of the wound itself, of the dressing, and the dresser are of the greatest importance.

(3) *Bleeding.*—Stoppage of bleeding is the first point to be attended to if it is serious. The most ready means of stopping bleeding is pressure, which may be carried out by tight bandaging above and below the wound or by placing a pad on the wound and bandaging over it. For ordinary wounds a simple pad and bandgage is usually sufficient to control the flow. If there happens to be a large vessel cut and the end exposed it should be tied around with clean thread which has been soaked in an antiseptic.

(4) *Cleaning.*—When the bleeding has stopped cut the hair from the edges of the wound and remove all dirt, clots of blood, splinters, and foreign bodies of every kind. This may be done by carefully syringing the parts with clean warm water or a warm antiseptic solution. Foreign bodies may be removed with forceps or by pressing small pieces of cotton soaked in an antiseptic solution gently over the surface of the wound. Punctured wounds (except those around joints) should be probed to ascertain if any foreign bodies are in the channel.

(5) *Closing.*—(*a*) Sutures and bandages are used for this purpose, but no wound that has been dirty must ever be entirely closed. Sutures and instruments must be aseptically clean.

(*b*) Sutures as a rule may be dispensed with entirely. They may be occasionally used in parts where there is little flesh, such as around the forehead, eyelids, and nose. They are less useful in the fleshy parts, because the movements of the muscles and the swelling resulting from the inflammation of the injured tissues cause them to pull out. Again, sutures must not be used when the edges of the wound are badly torn.

(*c*) In applying sutures the borders of the wound must be brought together in their natural position, care being taken not to allow the edges of the skin to curl inward. The thread, with the aid of a needle, is passed through the skin at one side of the wound and out at the other. The sutures should be from one-fourth to one-half inch from the edge, about three-fourths of an inch apart, and their depth should be about equal to their distance from the edge of the wound. They should be drawn just tight enough to bring the edges of the skin together. As a rule, they should be removed in about 8 days.

(6) *Drainage.*—In all infected wounds drainage is necessary for the removal of pus that would otherwise accumulate in them. The escape of such material must be provided for at the lowest part of the wound. If the wound be a vertical (upright) one this may be accomplished by leaving out a stitch at the bottom. In horizontal wounds (those running lengthwise of the body) a small vertical openings must be made below the line of the stitches.

(7) *Dressings.*—(*a*) Wounds that have been sutured and also wounds that are to be treated without suturing should be dried carefully with dry gauze or cotton, and a bandage applied. Or cotton soaked in an antiseptic may be put on and held in position by a bandage, care being taken to avoid undue pressure.

(*b*) If the location will not permit bandaging, the injured parts may be treated with an antiseptic and covered with a clean piece of cloth or gunny sack, the inside of which may be lined with a piece of gauze large enough to cover the wound.

(*c*) After a wound has begun to granulate (fill in with repair tissue), it will often heal much better if no dressing or bandage is placed in contact with the wound, provided it is not irritated by flies. Bandaging too long may prevent the area from covering itself with skin and result in proud flesh.

(8) *Rest and restraint.*—This will depend entirely upon the nature and extent of the wound. If the injury is slight the animal may continue at work; otherwise he may be kept in a box stall, cross-tied, or subjected to some other form of restraint.

(9) *Aftercare.*—All wounds should be kept dry and dressings should be changed only often enough to keep the wounds clean. As little washing as possible should be done, and the parts should be sopped instead of rubbed. After cleaning and drying a new dressing should be applied if it seems advisable.

(10) *Flies.*—The healing of wounds that cannot be covered is sometimes retarded by the presence of flies. The edges of such wounds, and also the surface if not too moist, may be covered lightly with pine tar.

(11) *Maggots and screw worms.*—(*a*) Wounds sometimes get flyblown and maggots appear. Their presence is recognized by a thin bloody discharge from the wound and the red, angry appearance of its edges. If the bottom of the wound is carefully examined, movement of the worm may be seen.

(*b*) With the forceps pick out all the worms that are visible and wipe out the cavity with a swab of cotton that has been saturated with tincture of iodine.

(12) *Excessive granulations,* (*proud flesh*).—In sluggish, slow-healing wounds small rounded fleshy masses which protrude beyond the edges of the wound are often formed. These fleshy masses are called proud flesh. The growth may be kept down by removing with scissors to the level of the skin and treating with boric acid or tincture of iodine or by searing to the level of the skin with a heated iron, care being taken to see that the surrounding skin is not burned.

b. Penetrating foot wounds (*nail pricks, etc.*).—(1) *Causes.*—Most penetrating wounds of the foot are caused by the animal stepping on nails or screws. At times the sensitive tissue of the foot may accidently be penetrated by a misdirected shoeing nail.

(2) *Prevention.*—Police corrals and roads for loose nails and screws. Exercise care in riding animals in the vicinity of wrecked buildings or new construction. In the field many nails and screws are picked up in horses' feet near ammunition dumps or warehouses. When packing cases are burned in rolling kitchens, nails from burned cases are often strewn along the roads.

(3) *Symptoms*—Most nail wounds occur in the frog at the juncture of the frog and bar. Noticeable lameness may not be immediate unless the nail remains in the foot, but will appear in a day or so and if not treated properly pus will form under the horn and break out at the heel. In such cases the foot is hot, the animal is in great pain, and lameness is very pronounced.

(4) *Nursing and first-aid treatment.*—If the nail is still imbedded in the horn, before removing it thoroughly clean all dirt from the bottom of the foot by washing and then wash with cresolis solution. Remove the nail or other object and with a knife, thin the horn over a fair-sized area surrounding the penetration and make a final opening about one-eighth to one-fourth inch in diameter through the horn to the sensitive tissue. A complete opening through the horn for drainage of wound secretions is essential. Saturate a rather small piece of gauze with tincture of iodine and place it *on* the wound. Over this place a pad of oakum covering part or all of the bottom of the hoof and held in place with strips of tin or light sheet metal of such length and width that their ends can be engaged between the hoof and the shoe on the inside at both sides of the shoe. Do not probe the wound in the sensitive tissue and do not compress the dressing so tightly that the secretions are dammed back into the wound. Dress daily with a mild antiseptic until the wound appears to be dry and healing and then apply a tar dressing under an oakum pack about every 3 days until no further dressing is necessary.

168. Eye injuries.—*a. Causes.*—Eye injuries are usually due to blows, scratches, or punctures from brush, forage, etc., and small objects lodging on the front of the eyeball or under the lids.

b. Symptoms.—Watery eye, flow of tears from the eye, reddened membranes, and partial or complete closing of the eye are symptoms of all forms of eye injury. If the cornea or clear part of the eyeball itself is injured, the cut or wound may be visible and surrounding it the eye will become milky white in color. Ordinarily, foreign matter merely lodged behind the lids does not cause the eyeball to become milky in color. The former is always more serious.

c. Nursing and first-aid treatment.—If there is a foreign body under the lids, flood it out with clean water, using the dose syringe or remove by the careful use of a tightly rolled swab of cotton or gauze. Then flood the eye several times daily with boric acid solution prepared by dissolving two level mess-kit spoonfuls of boric acid in a mess-kit cupful of warm water. Use the eye dropper for this purpose. Cover the eye with a pad of cotton about 8 inches square covered with gauze and held in position with strings tied about the head and to the halter or sew the pad on the inside of an improvised head bandage made from a grain sack. In bad cases soak the pad in boric acid solution before applying. Keep the animal in as dark a place as possible.

169. Fractures.—A fracture is a broken bone or other hard tissue such as hoof or cartilage.

a. Causes.—Most fractures result from kicks inflicted by other animals. Fractures of the bones of the legs are sometimes caused by sudden turn, stepping in holes, etc. The tibia, the long bone just under the skin on the inside of the hind leg between the hock and stifle joints, is the most frequently fractured bone in the body. This is accounted for by the fact that it has no muscular protection on the inside of the leg and a kick delivered from one side of the animal may pass under the belly and strike the inside of the opposite hind leg. The bone forming the point of the hip may be fractured by falling on the side or by an animal's striking it against the side of a door.

b. Symptoms.—When any long supporting bone of the leg is completely fractured, the leg dangles helplessly and will bear no weight. The skin over the fractured bone may or may not be broken either by the blow or by the ends of the bone. When the bone forming the point of the hip is fractured the animal may show but few symptoms other than lameness, difficulty in advancing the hind leg on

that side, tenderness, and swelling over the seat of injury and a noticeable lowering of the point of the hip on that side.

c. Nursing and first-aid treatment.—Complete fractures of any of the supporting bones of the legs of horses or mules are considered incurable and the destruction of the animal is authorized without delay. The animal may recover from a fracture of the bone forming the point of the hip provided the animal is given complete rest for a month or 6 weeks.

170. Sprains and strains.—*a. Cause.*—Violent effort in work or play or sudden checks, as in jumping or galloping over rough ground. Falls and similar accidents frequently result in injury to a joint or tendon.

b. Symptoms.—Lameness; heat and swelling in the affected leg; sensitiveness to pressure. The tendons of the forelegs are far more frequently affected than are those of the hind legs. The entire length of the tendons in the cannon region may be affected or only in a part of their length. The lameness and swelling may not be noticeable until the day following the actual injury.

c. Nursing and first-aid treatment.—Hot water applied several times daily is beneficial. If the joints below the knee or hock are affected the injured part can be immersed in a bucket of hot water. The parts are usually bandaged during the acute stage of the injury.

171. Contusions.—*a. Causes.*—Pressure from poorly adjusted or improperly cared for equipment and incorrect riding posture are the greatest causes of contusions to military animals. This is of particular importance in riding and pack animals, as an injured back results in an otherwise sound horse being lost from duty, frequently for long periods of time.

b. Prevention.—(1) Prevention of equipment injury entails training and discipline in which all concerned must realize the extraordinary damage which may be inflicted in a very short time by an ill-fitting saddle or collar. The individual rider must be held strictly responsible that the adjustment of his saddle, arms, and pack is correct; that his blanket is clean, and accurately folded; and that he reports at once to his immediate superior the slightest injury of any kind discovered on the back of his animal. Officers and noncommissioned officers must be unremitting in their efforts to prevent men from slouching in the saddle. Riders must sit erect in the saddle at all times. Riding on the cantle or standing in one stirrup is sure to bring saddle sores.

(2) The requirements for carrying weight successfully on a horse's back are briefly as follows:

(*a*) The back must be well muscled and conditioned to withstand this type of work.

(*b*) The pressure must be evenly distributed and borne only on the weight-carrying part of the back. (This requires more or less constant adjustment.)

(*c*) No pressure can be borne on the withers or the tops of the spine.

(*d*) Pressure must be partially removed from time to time (usually by dismounting each hour during a march) and entirely removed at least once during each 24 hours. Correct riding posture must be constantly maintained.

(*e*) The back and equipment must be kept clean.

c. Symptoms.—The symptoms are obvious. Abrasions, swelling, or tenderness on some part of the back. The condition most amenable to emergency treatment is a circumscribed swelling which appears soon after the weight has been removed. These are commonly known as "bunches" and unless properly treated will develop into serious wounds.

d. Treatment.—The treatment should be started as soon as it is apparent that a bunch is forming, usually 30 minutes to 1 hour after unsaddling. Apply cold irrigations or baths with gentle hand rubbing. This should be followed by the application of packs saturated and kept wet with cold water and held in position by means of a surcingle or bandage. The pad may be of oakum or it may be made by folding a gunny sack three or four times. Injuries to the withers and ridge of the spine should be irrigated or bathed with cold water but without pressure and without massage. Slight galls, chafes, or abrasions are treated with white lotion or powdered boric acid. Every effort should be made to ascertain and remove the cause with a view to preventing further injury.

172. Thumps (spasms of diaphragm).—*a. Causes.*—Overwork or fast work during hot weather, especially among animals not properly conditioned.

b. Symptoms.—General appearance of fatigue with spasmodic jerking noticeable in the belly and flanks. Frequently a distinct thumping sound will be heard.

c. Treatment.—If marching, halt the animal and if the temperature is found elevated reduce it by sponging the body with cold water. Then have the animal ridden or led into camp at the walk. The condition will usually disappear in 2 or 3 hours if the animal is given complete rest.

173. Heat exhaustion (overheating; sunstroke).—A condition resulting in disturbances of the nervous system due to heat.

a. Causes.—Long-continued hard or fast work during hot or very humid weather, especially among animals not in good condition or having heavy coats.

b. Prevention.—Keep animals in good condition to perform work required. Do not overtax the strength of the animal. Fit the marching rate and frequency of halts to the condition of the animal. Watch animals for early symptoms. Clip animals that have heavy coats. Water frequently on hot days.

c. Symptoms.—Thumps, a condition previously described, often precedes overheating. The animal that has been sweating freely will cease to sweat, or sweating is diminished, and the animal will be dull and require urging. The gait is staggering or wobbly, especially in the hind quarters. If halted, the animal stands with the legs spraddled; breathing very rapid and shallow; nostrils dilated; expression drawn and anxious; nasal membranes bluish red in color; and trembling of body muscles. The body feels hot to the hand and the temperature will be from 103° to 109° F. If in this stage the animal is forced to continue on the march, he will soon fall and likely die later, or drop dead.

d. Nursing and first-aid treatment.—Prompt first-aid treatment is of utmost importance. Stop the animal at once and in the shade if any is nearby. Remove the equipment and apply large quantities of cold water to all parts of the body but especially to the head, sides of the neck, groins and flanks. Inject cold water into the rectum with a syringe. Wash out the mouth and nostrils with cold water. Give the animal three or four swallows of water every few minutes. Under this treatment the temperature will drop quite rapidly, and as improvement is noted move the animal about very slowly and rub the body to prevent chilling. As soon as the temperature is near normal the animal may be moved slowly into camp. If possible the animal should be excused from work the following day but may continue the march as a led animal.

174. Exhaustion.—*a. Causes.*—Overexertion, excessive or prolonged heavy work, and lack of condition.

b. Symptoms.—After the animal arrives in camp, he may lie down and refuse his feed, especially his grain, yet drink considerable quantities of water. The temperature may be slightly elevated and the pulse may be weak and thready. Sweating may be quite noticeable and possibly patchy, yet the body may feel cold and clammy.

c. Nursing and first-aid treatment.—Make a comfortable place for the animal to lie. Cover the body with a blanket to prevent chilling. Hand rub the legs. Give small amounts of water frequently. Do not annoy the animal by too much attention. A period of rest is all that is needed for recuperation from this excessive fatigue. When rested, the animal will resume eating. Refusal of animals to eat for some little time after the termination of a hard day's march is not uncommon.

175. Colic.—A general term applied to abdominal pain caused by some form of digestive disturbance. For practical purposes, it is often classified as spasmodic and flatulent (or gas) colic.

a. Causes.—The causes of both forms of colic are very similar, but flatulent colic is more frequently caused by foods likely to ferment in the digestive tract, such as green clover or alfalfa, especially when wet or after being frosted. General causes are indigestible or spoiled foods, sudden changes in food, overeating while fatigued, working too soon after feeding, watering while exhausted or hot, bolting the feed, overeating of green feed, and watering too soon after feeding. Windsucking is frequently a cause of flatulent colic. Parasites, tumors, and abnormalities of any of the digestive organs may be a cause. Collections of sand in the bowel resulting from an animal eating from a sandy picket line may result in repeated attacks of colic.

b. Prevention.—Feeding suitable feed of good quality and attention to the principles of feeding and watering will prevent most cases of colic not due to internal causes.

c. Symptoms.—Pain as indicated by restlessness, pawing, stamping of the feet, looking around at the flanks, kicking at the abdomen, lying down, rolling, sweating, and frequent attempts to defecate usually resulting in the passage of but a few pellets of dung or a discharge of gas. In the so-called spasmodic form the attacks of pain are often intermittent with short periods of a few minutes of apparent freedom from pain. In the flatulent (gas) type of colic, the digestive tract is filled with gas and so the belly is often greatly distended. Breathing is often difficult because of pressure on the lungs caused by the bloat. The temperature is normal or but slightly elevated in the beginning of all forms of colic. If the sickness continues for a day or so the temperature may rise considerably.

d. Nursing and first-aid treatment.—Rational treatment includes relief of pain and elimination of the irritating bowel contents. Place the animal in a well bedded box stall, or if in camp bed down a

section of the picket line and have an attendant hold the animal's tie rope. Do not force an animal with colic to move about at a trot, as it never can do the animal any good and often does great harm or may cause death if the animal is bloated. Do not attempt to keep the animal from rolling, etc., unless he is throwing himself to the ground so violently that it is evident he may rupture some organ. Give frequent rectal injections of 2 or 3 gallons of warm, soapy water. Wring blankets out of hot water and wrap around the belly and flanks as hot as can be borne without burning the hands or animal. Do not allow any food, but water may be given in small amounts. Do not attempt to drench the animal with various concoctions, as may be suggested. Improper or excessive medication has resulted in the death of many animals that would have otherwise recovered. Withhold all food for at least 12 hours after all pain has disappeared and feed light for 2 or 3 days.

176. Diarrhea.—*a. Causes.*—Spoiled food; overfeeding of "washy" foods such as alfalfa, clover, bran, etc.; nervousness; sudden changes of diet; and errors of feeding.

b. Prevention.—Careful attention to kind, quality, and quantity of feed and methods of feeding. Exclude "washy" feeds from diet of animals which tend to scour.

c. Symptoms.—The droppings are frequent and of semifluid nature. They may be of a normal color and odor or of a gray color and fetid odor. If the condition continues long, the animal loses flesh and appetite is wanting.

d. Nursing and first-aid treatment.—Correction of diet in mild cases will be sufficient. Give the animal absolute rest while withholding all food and limiting the amount of water for a period of 24 to 48 hours. After this period feed lightly and do not allow excessive amounts of water. Rest the animal until the droppings have returned to their normal consistency.

177. Azoturia.—*a. Causes.*—More or less violent exercise following enforced idleness of animals in good condition when appropriate reduction has not been made in the ration during the period of idleness.

b. Prevention.—When conditioned animals accustomed to regular work are given a period of complete rest for longer than a day, reduce the grain ration by at least one-half or cut it to one-fourth of the usual allowance and give more hay. When animals are first exercised after a period of rest they should be first walked for a period of at least 20 minutes after leaving the stables and not called upon to do more than a very small amount of fast work the first day.

c. Symptoms.—The disease usually appears within the first 20 minutes after leaving the stable if the animal is restive or in high spirits and exerts himself accordingly, but may not appear until much later. Increased excitability, profuse sweating and rapid breathing are the first symptoms. Very soon the animal begins to stiffen in his hind quarters, drag the hind legs and knuckle over in the hind fetlocks. The muscles over the croup and loins become swollen and dense but not sensitive to pressure. There is no marked increase in temperature but because of exercise and excitement the temperature may be as high as 102° F. If continued in work the animal will become completely incapable of supporting weight on the hind legs and fall to the ground and in such cases the chances of recovery are remote. The urine is scanty and red or coffee-colored.

d. Nursing and first-aid treatment.—Stop the animal immediately when the first symptoms are observed. Remove the saddle or harness at once, and cover with three or four blankets. Keep the animal standing, if possible; if not, provide a good bed. Heat some oats or common salt, place in a sack, and spread over the loins to relieve the pain. If hot water is available, a hot blanket wrung out, placed over the back and loins, and covered with dry blankets is very beneficial. This should be changed often. After a few hours the average case can be moved slowly to the stable, provided the distance is not too great. At this time the animal should be given a purgative and be fed on bran mashes, grass, and hay for a few days.

178. Thrush.—*a. Causes.*—Lack of proper grooming of the feet, particularly failure to clean out thoroughly the depths of the commissures and cleft of the frog. Lack of frog pressure, filthy standings, dryness of the feet, and cuts or tears in the horny frog are all contributing causes.

b. Prevention.—A thorough washing of the under surface of the hoof once a week will materially assist in prevention of this disease. Correct shoeing and regular exercise are also important preventive measures.

c. Symptoms.—Cracks, depressions, or fissures in the horn of the frog in which is found a thick, dark colored discharge with a very offensive odor. The cleft of the frog and the sides of the frog at the depths of the commissures are the parts usually diseased. The destruction of horn is progressive and the horn may be under-run and loosened some distance back from the edges of the external opening. Lameness is usually absent except in advanced cases where the destruction of horn has extended to the sensitive tissues.

d. Nursing and first-aid treatment.—Clean and wash the hoof. With a sharp hoof knife, trim away all diseased and under-run horn and all ragged pieces. This is very important. With cresolis solution (1½ mess-kit spoonfuls to mess cup full of water) and a stiff brush thoroughly scrub the horn. After it has dried, paint the area with iodine. Repeat the washing and iodine treatment daily until the horn begins to appear dry and then apply pine tar. If hoof is contracted, shoe to correct. Ordinary cases of thrush can be readily cured, but cases in which the horn in the cleft has been completely destroyed and a deep fissure extends up between the bulbs of the heels are more difficult, and if not carefully watched will recur.

179. Communicable diseases.—*a. General.*—Communicable diseases are diseases that are transmitted or spread from animal to animal either by direct contact between the sick and well or indirectly through the medium of infected stables, water troughs, corrals, stock cars, food, etc. The diseased animal throws off in the discharge from his nose, mouth, digestive system, urinary system, or from the skin the poison or material which will cause disease in the susceptible animal. These diseases deserve more attention than noncommunicable diseases among military animals because they are most likely to appear where animals are congregated in considerable numbers. Some of these diseases are incurable, some may be transmitted to man, and all may cause great losses, especially during campaign, if not held in check. They are one of the chief causes of animal losses during active service in campaign. Communicable diseases are always marked by a period of incubation, which is the time interval that elapses between the infection and the appearance of symptoms. This period may vary from a few hours to several weeks.

b. Predisposing causes.—Certain causes or conditions that lower the vitality and natural resistance of animals to disease, thereby rendering them more susceptible to infection are termed predisposing causes. The chief of these are—

(1) Exposure.
(2) Working animals hard before they are in good condition.
(3) Lack of sufficient food.
(4) Improper grooming.
(5) Change of environment.
(6) Long shipment by rail or sea.
(7) Other diseases.
(8) General debility.

c. Prevention.—(1) *General.*—The most economical and logical way to prevent the entrance of a communicable disease is to correct the

faulty conditions that predispose the animal. Proper conditioning and seasoning, plenty of wholesome food, good grooming, and protection from undue exposure to the elements and mud keep the animals strong and in such state of health that they can resist a great amount of infection. When a disease once gains entrance to a group of animals, there are certain rules of procedure that have been found absolutely necessary in checking the spread to healthy animals and in stamping out the disease. These measures may be listed as follows:

(*a*) Daily inspection of all animals in order to detect new cases. This insures the prompt removal of the sick as a source of infection and the initiation of the proper treatment or destruction.

(*b*) Quarantine of exposed animals.

(*c*) Isolation of the sick animals.

(*d*) Disinfection of infected premises, equipment, and utensils.

(2) *Daily inspections.*—It is the duty of the veterinary officer to make daily inspections. Constant vigilance on the part of the officers in charge of animals materially assists in the prompt detection of new cases.

(3) *Quarantine.*—(*a*) Quarantine is the separation of the apparently healthy that have been exposed to the risk of infection from those that are healthy and have not been so exposed.

(*b*) The object of a quarantine is to afford to a disease that may be latent a sufficient time for it to become both active and obvious. In other words, to give exposed animals time to develop a disease before allowing them to associate with those that have not been exposed.

(*c*) A uniform quarantine period of 21 days has been adopted by the Army. This is the average time after exposure to infection required by most communicable diseases to develop the first symptoms. The discovery of a new case in a quarantine group is cause for beginning a new 21-day period of quarantine. The quarantine of exposed animals during an outbreak is both mandatory and necessary. Paragraphs 23 and 24, AR 40-2035, prescribe that all animals newly arrived from any place whatever must be quarantined 21 days before being allowed to mingle with other animals in the command. This is a very necessary measure for preventing the introduction of a disease into a healthy command.

(*d*) The place selected to use for quarantine purposes should be located so that it is impossible for other animals either to enter or come in contact through the corral fences. The ideal corral is surrounded by two fences 10 to 12 feet apart and has separate watering facilities. The attendants should not have to handle other animals. The severity of the quarantine rules depends largely upon the nature

of the disease. The seriousness of such diseases as glanders and anthrax calls for carrying out the most stringent rules of quarantine in order to be effective. The following general rules should be observed in conduting a quarantine stable or corral:

1. Post "Quarantine" signs at the gate and doors and allow no unauthorized persons or animals to enter.

2. Clean the watering troughs or buckets daily.

3. The attendants should not be allowed to handle other animals.

4. Inspect all animals daily for the early symptoms of disease.

5. Remove new cases immediately.

6. Burn the manure, bedding, and soiled forage or remove same to a dump and burn.

6. Disinfect the feed boxes, mangers, water buckets, troughs, and woodwork frequently.

8. Prevent animals drawing police wagons from coming in direct contact with quarantine animals.

9. Clean and disinfect the premises; also all equipment and utensils at the conclusion of the quarantine.

(4) *Isolation.*—The absolute segregation from all other animals of an animal affected with a communicable disease or one suspected of being infected is termed isolation. It differs from a quarantine in that it is a segregation of animals that are actually sick. It must be complete in every detail in order to be of any value. The degree of isolation necessarily varies with different diseases.

(5) *Disinfection.*—The application of agents called disinfectants for the purpose of destroying disease-producing material is called disinfection.

(*a*) *Cleanliness.*—Germs find temporary resting places to propagate and are hidden by dust and dirt. It is essential that a thorough cleaning always precede disinfection. It is time wasted to disinfect a stable, grooming kit, stockcar or anything else unless it has been previously prepared by cleaning.

(*b*) *Disinfectants.*—Fresh air, wind, and sunlight are powerful disinfectants, for which reason a stable with plenty of windows and well ventilated is more sanitary than one that is dark, damp, and evil-smelling. The chemical disinfectant used almost entirely in the Army is a 3 to 5 percent compound solution of creosol in water. This solution should be sprayed on all surfaces with a fine spray under pressure. Stable utensils and equipment may be immersed in the solution for 2 to 4 hours.

180. Cast and falls.—*a*. Occasionally an animal will fall in the stable or become cast in the stall in such a manner that it is unable to rise. In such a case the following procedure should be followed:

(1) See that the animal has plenty of room. If it is in a single stall pull it out into the aisle.

(2) Turn it over, by attaching ropes to the lower hind feet and forefeet. Then see that the feet are on the same level with or lower than the back.

(3) Assist the animal to roll up on its breast, and allow it to remain quiet for a few minutes.

(4) Pull the front feet out in the position naturally assumed by a horse when it is about to rise.

(5) Stand close against the buttocks and grasp the tail. Be prepared to exert a pull upward and forward. Leave the head alone.

(6) Now speak sharply to the animal or slap it lightly with a strap and lift the tail as directed.

b. In case it is impossible to raise the animal by this means, it may be necessary to use a sling. The articles required are a block and tackle of sufficient strength and 30 feet or more of rope. The block may be fastened above the animal in the stable, or in the field a tripod may be improvised from strong poles. The rope is placed around the animal as follows:

(1) Double it, put the head through the loop, and carry the loop back to the collar seat. Pass the free ends of the rope between the front legs, crossing the ropes just before they go between the legs. Pass the lower rope under the body so that it emerges just back of the withers.

(2) Lay the upper rope over the chest so that it crosses the lower rope at this point.

(3) Bring the lower rope over the body and between the hind legs.

(4) Pass the upper rope under the body in a position corresponding to the other rope, crossing the two ropes as they emerge from between the hind legs.

(5) Bring both ropes up over the buttocks, one on each side of the tail, and pass them forward along the back, under the crossed ropes, and tie to the loop which lies at the top of the neck. Draw the ropes as tightly as possible before the knot is tied. Now attach the hook of the block under all the ropes at the point on the back where they intersect, namely, the single strands crossing to go between the hind legs and the double strand coming forward from the tail, and the animal is ready to be raised.

Section VII

X-RAY SERVICE

181. General description.—The X-ray department serves three general purposes in a hospital: fluoroscopy, roentgenography, and roentgenotherapy.

a. For fluoroscopy, the patient is placed in front of the X-ray tube (at a distance of 12 to 14 inches) and between the tube and a "fluoroscopic screen." The fluoroscopic screen is simply a cardboard, usually measuring about 12 by 16 inches and having a coating of tungstate or zinc crystals, this coating being covered by a lead-impregnated glass facing the medical officer. When the X-ray switch is closed, many of the X-rays which are produced pass through the patient and those which hit the fluoroscopic screen produce a "fluorescence," or a lighting effect. The fluoroscence on the screen is variable, depending upon the quantity of X-rays which play upon the crystals of the chemical contained on the screen. The result is that where densities such as the heart, liver, or bones interfere with the passage of the X-rays, less fluorescence is produced and therefore the image on the fluoroscopic screen is that which we might imagine seeing if we were to look right through the less dense tissues of the individual. When studied in a darkened room the more dense tissues appear dark, while the less dense tissues appear lighter; for instance, the lungs, which contain much air, appear as large spaces in the chest. The contrast of the fluorescent densities is controlled by adjustments on the X-ray machine. In the case of very thin individuals, relatively low "settings" are made whereby the electrons which hit the target of the X-ray tube are driven with a relatively low force or voltage. In the case of very large individuals, more penetrating X-rays must be produced and in order to produce more penetrating X-rays, a greater force (voltage) must be developed in the X-ray machine and therefore a higher "setting" is made.

b. For roentgenography (X-ray pictures), the part of the patient to be studied is usually placed beneath or in front of the X-ray tube and instead of using a fluoroscopic screen, a film, enclosed in either a lightproof cardboard envelope or a metal "cassette", is

placed under the part to be studied. Depending upon the density of the part and thickness of it, one or another quality of X-ray is selected by the X-ray technician on the basis of low or high "settings." The quantity of X-rays showered through the part is also varied. A good technician will know exactly how much X-radiation and what quality of X-ray should be applied for any particular part. If the exposure technique be sufficiently scientific, it will then merely be necessary to take the X-ray film into the darkroom and immerse it for a definite number of minutes in a "developing" solution and then after washing it, immerse it into a "fixing" solution (again, for a definitely set time). The developing solution produces a chemical change, blackening those silver salts of the emulsion which have been affected by the X-rays, but not affecting the silver salts which were not affected by the X-rays. The "fixing" solution removes all of the silver salts and other chemicals which have not been affected by the X-rays. It also hardens the emulsion on the film so that it cannot be easily scratched off. After "fixing", it is necessary to completely wash the film; otherwise, the fixing solution will dry on it and the film will appear as if it were covered by a coating of salt. Then the film is dried. This procedure of handling the film through the chemicals and wash waters is called "processing."

c. For roentgenotherapy (X-ray therapy), the part of the patient to be treated is usually placed under the X-ray tube. For this purpose, considerable quantities of X-rays are applied and therefore all parts of the patient other than those to be treated are covered with lead or they are protected in some other way. The medical officer selects a certain quality of X-rays by means of changing the voltages of the electrical currents and by inserting filters into the stream of the X-rays. He varies the quality and the quantity of the X-rays, depending upon the type of lesion and its location, (that is, whether it be located on the surface, a few centimeters beneath, or very deep). During X-ray treatments, the whole room becomes filled, more or less, with X-rays, because "secondary X-rays" are given off from the patient due to the effects of the "primary X-rays" which come from the tube itself. Therefore, neither the medical officer nor anyone else, except the patient, should be in the room while a treatment is being given.

182. Component parts of an X-ray machine.—There are certain component parts which are common to all X-ray machines—a main switch, an auto-transformer, an X-ray switch, a high tension transformer, a low tension transformer, a filament regulator, and an X-ray tube.

a. The main switch may be of a double pole, throw switch design or it may be of a plunger type. By closing it, provided the line cable be connected, usually the circuit to the auto-transformer as well as the circuit to the low tension transformer are closed. Because of the later effect the filament of the X-ray tube is lighted.

b. The auto-transformer is an instrument which serves to vary the voltage which is to be applied to the high tension transformer. The various "settings" are made on it.

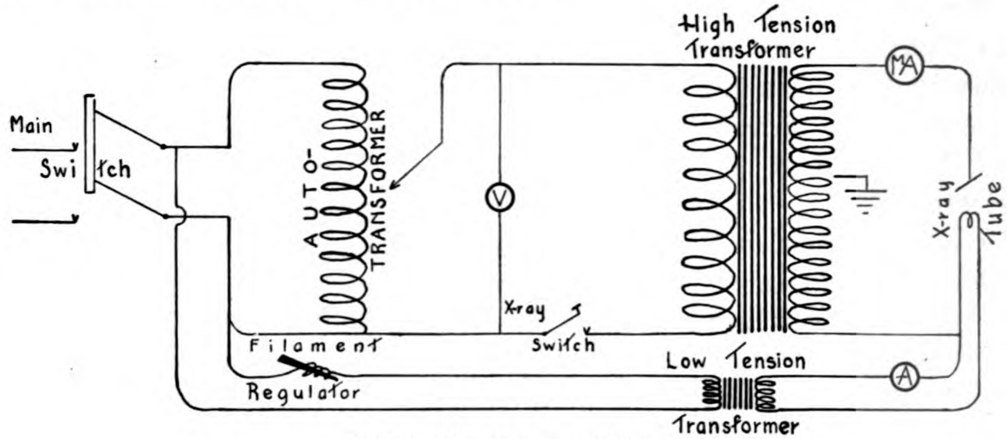


FIGURE 56.—X-ray machine.

c. The X-ray switch closes a circuit between the auto-transformer and the high tension transformer. Thereby another circuit is induced wherein the electrons flow through the X-ray tube. This latter circuit is the "secondary circuit" from the high tension transformer.

d. The high tension transformer is an instrument which "steps up" (increases) any voltage which is applied to its primary windings so that there is developed in its secondary windings a much greater voltage, as much as ten thousand times or more the voltage applied to the primary winding.

e. The low tension transformer is an instrument which "steps down" (decreases) any voltage which is applied to its primary windings. It is designed to supply quantity of electrons rather than voltage (or pressure) and in the case of X-ray equipment it is found in a filament circuit.

f. The filament regulator is an instrument (usually a "rheostat" or a "choke coil") which is used to change the volume of current which flows through the filament of the X-ray tube.

g. The X-ray tube is a tube which is energized by at least two circuits: the filament circuit and the high tension circuit. Within the X-ray tube, there is an almost perfect vacuum. The high tension circuit is incomplete to the extent that there is a gap in it,

between the filament and the target of the X-ray tube. Ordinarily, electrons cannot flow across a gap, in a vacuum, regardless of how great the voltage might be and regardless of how short the gap might be. However, when a metal which is acting as a conductor of electrons, is heated, the electrons are set free and thereby the resistance of a gap is lessened. By means of a filament current, one terminal (cathode end) of the potential high tension circuit is heated; electrons are thereby freed and move outside of the conductor, and with the voltage of the high tension circuit itself they are forced to "jump" across the gap and to hit the target, which is the other terminal of this high tension circuit. The electrons move on to complete the circuit back to the high tension transformer. X-rays are produced at the site on the target receiving the impact of the electrons. The resistance between the filament and the target can be varied by controlling the heat of the filament with the use of the filament regulator. Depending upon the amount of this heat, more or less electrons get across to the target, and thereby more or less X-rays are produced. Depending upon the voltage which is selected by variable settings on the auto-transformer, the effective high tension voltage of the secondary winding of the high tension transformer can be controlled and thereby the force of impact of the electrons upon the target of the X-ray tube can be controlled. The greater the impact of the electrons within the X-ray tube, the shorter the wave-length of the X-rays produced; and the shorter the wave-length of the X-rays produced the greater is their penetrating power (through tissues and objects) and vice versa.

h. Many other component parts might be mentioned: fuses, circuit breakers, valve tubes, meters, line voltage compensators, relays, condensers, etc., but all of these are simply auxiliary to the more important parts described above.

183. Hazards.—*a.* X-ray equipment should be manipulated only by those who have received special training and who understand how the equipment functions. X-rays are invisible and they are developed by means of very high voltages of electricity. Actually, X-rays are produced by the impact of electrons. Electrons are the most minute particles of matter; they are the units of electricity. X-rays are produced during thunderstorms when at the time of the "lightning" a torrent of electrons are flowing like water in a powerful waterfall, and because of the tremendous voltage (having force) which causes them to flow, they hit a tree or a building or the ground with a terrific impact. We seldom think of X-rays being produced at such occasions because we cannot see the X-rays. We see the light-

ning; in other words, we see the effect of a torrent of electrons but if camera or X-ray films were left in the vicinity where lightning were to strike, even though these films be protected against light, it would be found that the emulsions would become sensitized by X-rays produced at the time of the lightning striking some object—the impact of electrons. All of us respect and fear lightning bolts. We should have the same degree of respect toward the equipment which is used to develop X-rays, and we should have the same degree of fear as regards the possibilities of what might happen in case of doing the wrong thing, for within X-ray apparatus harnessed lightning bolts are put to use. This means that unless we have a thorough understanding of what will happen when inserting a plug into an electrical receptacle or when closing a switch or turning a dial, unless we fully understand the consequences of all such handlings, we should never risk a "tryout" with any part of an X-ray machine.

b. So far, mention has been made only as to the danger concerned with the electricity aspect of X-ray apparatus. There are at least three types of danger concerned with the handling of X-ray equipment—electrical, X-radiation, and fire.

(1) *Electrical dangers.*—(*a*) Electrocutions are conducted with voltages varying from 1,800 to 3,600 volts. X-ray activities are conducted with voltages varying from 30,000 to 1,000,000 (and more, year by year). It is true that voltage by itself is not a killing factor, but by means of voltage (that is, electrical force) electrons are able to jump very great distances and thereby make "contact." Death is dependent upon the volume (that is, the numbers) of electrons which make this jump and which flow through the body. The duration of the flow of electrons is also a factor concerned with the likelihood of killing or burning. Moreover, the direction of flow of the electrons through the human body is important. Whether a part of the body might be burned or whether death of the individual actually results depends upon the quantity of electrons going through the heart. For instance, if the electrons flow from one hand through the chest and out by way of the other hand or by way of one hand and out by way of the opposite foot, the heart is likely to be affected by a large proportion of the electrons and death is most likely to result. This type of death would be an electrocution, and since it is not always instantaneous, it is important that every soldier know what to do in attempting to rescue anyone who is so afflicted and then to know how to proceed in the way of treatment.

(*b*) Usually, the victim is unable to detach himself from the electric current because the stimulation of electricity causes his muscles to contract and to hold on to the electrical contacts. Nevertheless, his friends or rescuers should never actually grip him, for in so doing they themselves may also be electrocuted before they can detach this victim from the electrical supply. So, instead of forging ahead and grasping a victim of an electrical contact, the first thought should be to detach the wall connection or to open the main switch having to do with the supply of the electricity. If such connections or switches are not in ready reach, a sheet or a rope might be thrown over the victim and in that way he should be quickly pulled away. After once detaching him from the electricity, treatment can be given. The victim should immediately be placed flat on his abdomen; his face turned to one side to promote the greatest ease of breathing and then the Schafer method of resuscitation should be instituted.

(2) *X-radiation dangers.*—(*a*) With any single large quantity of X-radiation, considerable damage to the skin and blood cells might result. Even with small quantities, if the exposures be repeated, very serious damage might occur. In the first instance, there might result a so-called "X-ray burn." This would not be realized for a week or more after the exposure. In the beginning, its appearance is similar to that of an ordinary sunburn. We are all familiar with the fact that a sunburn becomes manifest 12 to 24 hours following the actual exposure to the sun rays. With an X-ray burn, there is even greater delay in the appearance of the effects; as mentioned, the redness and irritation might not appear for as long as 10 days after the exposure to the X-rays. After it once appears, it is much more stubborn than are the effects of sunburn. The redness may progress to blistering, to the exudation of a watery secretion, to crust formations, and even to the development of actual ulcers. These effects usually persist for a long time—weeks, months, and even years. Even mild dosages of X-rays are sufficient to cause hairs to fall out. These effects, too, are delayed; the hairs usually begin to fall out about 1 week following the exposure and by the end of 10 days to 2 weeks the area exposed may be entirely smooth and free of hairs. With much smaller dosages, there may be no evidences of damage to the body until months later. As mentioned, if repeated small dosages of X-radiation be received, the effects may be as serious as if a single large dosage were received. Usually, though, when smaller dosages are received repeatedly over a relatively long period of time, the effects are not concerned with the skin but with the blood cells. There may be no redness nor irritation. The individual may simply develop a feeling of tiredness and general

weakness. He may appear pale and if a blood count is made it is likely that there will be found a very low white cell count and particularly a low count of lymphocytes. There might be a low red cell count, as well. All of these effects are very serious, because if they continue very long the tissues which ordinarily produce the blood cells will become exhausted and there may result a real "aplastic anemia." On the other hand, in trying to restore the needed number of blood cells which have been destroyed, these restorative tissues may become overstimulated and produce too many cells. This is especially to be considered with regard to the excessive manufacture of white blood cells, in which case a "leukemia" may result.

(*b*) These possibilities must be considered as far as protection to one's self is concerned and also as far as protection to patients who are being X-rayed is concerned. Attendants working in an X-ray department understand these dangers and they know what to handle and what not to handle; moreover, they know where to stand where not to stand. It is best that the stranger keep well away from equipment, whether it is being operated or not. As far as possible, it is well to wait in a hallway or in another room whereby there will be a wall as protection against the X-ray apparatus. If it is absolutely necessary to be in the room with the machine, it is always well to be to one side of the X-ray tube and away from the "X-ray beam," at a distance of 6 feet or more.

(*c*) X-ray effects are also destructive of all types of films. Very little X-radiation exposure will completely fog or blacken hundreds of films. Therefore, it is important that all films be removed from the X-ray room unless they be stored in lead-lined boxes. Moreover, films should not be stored in an adjoining room without protection by 1 or 2 millimeters' thickness of lead, for X-rays are able to get through most walls, floors, and ceilings. This fact should be known to all soldiers of the Medical Department and Quartermaster Department, for X-ray technicians may not be handy to give or advise the necessary care of these films and it is likely that films will be handled at some time or another by any soldier even if only to carry them from a supply depot to the hospital.

(3) *Fire hazards.*—A number of very disastrous fires have occurred because of carelessness about X-ray films. Formerly X-ray films were composed of a highly combustible base. More recently, these films have been improved somewhat so that now a less combustible base is used. But this base will burn. It burns more slowly and at about the rate that paper would burn, but there still remains considerable fire hazard. Therefore, it is still important to avoid smok-

ing in an X-ray department and "No smoking" signs should be posted and heeded. It is important to remove all patients from the vicinity where films are smoking or burning.

184. Attending patients in the X-ray department.—Practically every member of the Medical Department will at some time of his service be required to escort patients to the X-ray department. When doing so, it is important to realize that most of these patients are really sick. Sometimes they may not appear to be so, just because they may want to appear brave. A very large percentage of people are afraid of physical examinations, but they seldom care to admit it. These people are usually particularly afraid of an X-ray examination. Their fears are increased when they have to go into the darkroom for fluoroscopic studies. Attendants of such patients should be kind and polite. When escorting women patients, it is always important to see that there is a nurse or a relative present.

The best plan is simply to take the patient to the waiting room until called for by the doctor.

185. General care.—Even the smallest designs of X-ray machines cost as much as an automobile. The larger designs cost as much as an armored tank. Of course, X-ray equipment is much lighter than either, and sometimes it has to be moved around. When handling it, every soldier should realize its worth and exercise great care to avoid breakage of it. In addition to the value of the machines themselves, most of the other equipment about the X-ray department is likewise expensive. For instance, the film holders (cassettes) cost approximately $100 and yet one can be ruined simply by leaving it open and allowing a very small quantity of water to collect on it.

CHAPTER 4

NURSING AND WARD MANAGEMENT

SECTION I

GENERAL

186. Introduction.—*a.* The fact that Army nurses are on duty at all of the larger hospitals of the Army does not relieve medical soldiers of the responsibility of acquiring a practical knowledge of the principles of nursing. Even where graduate nurses are assigned, enlisted men work side by side with them in ministering to the sick and wounded.

b. Army nurses are not assigned to many of the smaller hospitals or to clearing stations in the field. All of the nursing required in those establishments and units must be rendered solely by enlisted men. The

conditions most essential to the recovery of the sick are rest, absolute cleanliness, an abundance of fresh air, and the timely administration of the treatment prescribed by the medical officer. These the nurse should always seek to assure. Not all medical soldiers are fit to become nurses. They must, however, receive training in this subject in order to show whether or not they possess aptitude along those lines. Study and experience are necessary, and the two must go together.

c. There are certain attributes or qualifications which are essential for those upon whom falls the nursing care of the sick or wounded. Certain physical qualifications are necessary and these include good health, strength, endurance, and strict obedience to the laws of personal hygiene. This necessitates daily bathing, frequent brushing of the teeth, keeping the hair properly cut and clean, regular habits of eating and sleeping, and plenty of exercise in the open air. Mental qualifications include intelligence, good judgment, a sense of order, good memory, truthfulness, obedience, tactfulness, sympathy, and a sense of professional ethics.

187. Wards.—*a.* Wards of all hospitals are as a rule arranged on the same general plan. The number of beds in each ward varies from 12 to 50, each ward having toilet facilities including latrines, washbowls and baths, and tub or shower or both. Wards usually have one or several private rooms for special or seriously ill cases, and in addition, a ward surgeon's office, a nurses' room, a utility room, and a linen room.

b. In peacetime hospitals the beds are usually arranged in pairs between adjacent windows, with a space of 3 to 4 feet between beds. About 100 square feet of floor space and 1,200 cubic feet of air space is allowed to each bed, a minimum of 72 square feet of floor space being allowed under certain circumstances. In the tropics the space allowed should be increased to 150 square feet of floor space and 3,000 cubic feet of air space.

c. Adjoining each bed is a bedside table and a chair, while behind each bed, in some military hospitals, is a wall locker. Folding screens or cubicle curtains are available so that at least some of the beds on the ward can be inclosed, forming private cubicles for bathing, examining, or isolating patients. Many of the wards in our military hospitals have solaria or recreation rooms where ambulant and convalescent patients can congregate. In the nurses' office is a desk, medicine cabinet, sterilizer, washbowl, and frequently a refrigerator.

188. Heating and ventilation.—The average ward temperature should be 70° F. during the day and 65° F. at night. A thermometer should hang in a central place in the ward and the temperature

checked from time to time so as to keep this temperature as constant as possible.

189. Duties of personnel.—*a.* Each ward is under the care of a nurse or wardmaster who under the ward surgeon is responsible for the comfort, diet, and medication of the patients, the performance of their duty by the attendants, the guarding of government property, the regulation of the heat, lights, and ventilation, and the cleanliness of the bed linen, clothing, lavatories, baths, washbowls, and floors.

b. The nurse or wardmaster accompanies the medical officer on his rounds. Cultivating the habits of observation, neatness, and system is essential. In passing about the ward, they should observe the condition of the patients, the beds, chairs, and tables, and should at once correct anything that is out of order. There should be a place for everything and everything should be in its place. It is the duty of the nurse or, if a nurse is not available, of the wardmaster to see that all orders written by the ward surgeon in the ward order book are carried out.

c. Ward attendants must be in proper uniform at all times; the uniform should be clean, the brass shined, and shoes polished. The uniform prescribed for ward attendants in the Army hospitals is the white uniform. The fatigue uniform can be worn when doing police work that would soil the white uniform. Ward attendants are required to wear a blouse when waiting on patients. Smoking should be done while absent from ward, while on errands, or at meal times. The hair should be kept neatly trimmed, and the hands and nails kept scrupulously clean. Clothing should be neat and clean. Attendants should not have financial dealings and should not engage in games with the patients. Gentleness, kindness, and tolerance should be exercised at all times when dealing with patients.

d. A ward attendant, if seated, should immediately arise and come to attention when an officer enters the room. When strangers or visitors enter the ward, the nurse should ascertain their business and show them proper courtesies; they should not be allowed to wander through the ward unescorted. The nurse or wardmaster should not leave the ward without informing the next nurse or attendant in charge where they are going, and for how long. The latter should be placed in charge formally before leaving.

e. Ward attendants should assist the medical officer in charge and the nurse in the proper control and supervision of the patients. Any disregard or disobedience of the rules and regulations of the hospital by any of the patients should immediately be reported to the nurse or, in her absence, to the ward surgeon. Ambulant patients are

required to keep their hair brushed and trimmed, their nails clean, to wear socks, to keep their shoes laced, and to exercise good personal hygiene. Convalescent suits, if worn, should be clean and kept buttoned, and bathrobes, if worn, should be kept belted and tied. Ambulant patients are often assigned by the ward surgeon to assist the ward attendant in the various duties in the ward. It helps to keep the patients' minds occupied and has a good psychological effect in hastening their recovery.

190. Fundamentals of ward management.—Responsibility for the proper management of the ward rests upon the ward surgeon. This management, however, can be successfully carried out only with the wholehearted cooperation and assistance of the nurses and ward attendants. The professional attention, care, and treatment of patients is of primary importance, but such care and treatment cannot be properly accomplished unless efficient administrative methods are maintained. Absolute cleanliness, orderliness, and quietness are the first essentials of ward administration and can be obtained only through the constant vigilance and effort of the ward personnel.

191. Ward cleaning.—*a*. Going on duty in the morning, the nurse or wardmaster must begin at once to get things in order for the morning rounds, usually at 9 o'clock. All ward attendants must report promptly and assist in this work. Chairs should be put in their places, beside tables cleared of superfluous articles, and beds made up. Bed patients should have their hands, faces, and teeth washed and hair brushed.

b. Everything in the ward should be dusted daily. This includes the beds, bedsprings, chairs, lockers, bedside tables, windows, radiators, electric light fixtures, woodwork, doors, and desks. Particular attention should be taken to insure the removal of all dust in the corners, behind radiators, and in cracks and crevices.

c. The cleaning of the floors will depend upon the composition of the floor. Linoleum and hardwood floors should be kept polished. Composition floors should be mopped daily with warm, soapy water. In mopping floors the water should be changed frequently. After mops are used, they should be cleaned well and dried in the sun. Floors should be swept at least three time daily, care being taken so that no dust is raised in this procedure. Slippers, shoes, baggage, and other such articles should be kept off the floor.

d. Copper, brass, and nickel should be polished frequently with metal polish. Porcelain utensils, sinks, and tubs are best cleaned by warm water and soap, using the necessary amount of muscular effort. Sand soap should not be used, since this will scratch the surface.

e. After the ward is made ready the lavatory should be attended to; all urinals, bedpans, and bottles should be thoroughly cleaned, shelves wiped off, closet bowls and seats washed, and bathtubs scrubbed.

f. Whenever a bed is vacated, mattress and bedding should be thoroughly aired and sunned and disinfected if necessary. The same bed linen should never be used for two consecutive patients without washing.

g. To prevent pollution and avoid unpleasant odors, all discharges such as urine, feces, sputum, and vomited matter, soiled dressings and linens, and dirty vessels should be promptly removed. The vessels containing discharges should be covered at once, a bedpan or urinal cover being used, and should never be carried through the ward uncovered.

h. Soiled dressings should be placed in a special covered pan or a paper bag.

i. Sputum cups, if of the metal type, must be frequently disinfected by boiling, and bed pans and urinals scalded with hot water after use. All should be kept scrupulously clean.

j. All articles of clothing and toilet articles used by the patients should be neatly arranged on the bedside table or in the locker. Window sills and radiators should not be used as shelves.

k. All mops and brooms, when not in use, should be kept on a rack provided for that purpose. All scrub and waste buckets should be kept clean and free of deposits. *Phenol preparations are not necessary nor indicated for cleaning purposes.* Upon entering a properly maintained ward one should not be met with the odor of disinfectants. The liberal use of soap, water, and muscular effort are all that are needed to keep a ward clean.

l. The ward should be kept in such state of cleanliness at all times that, regardless of the time the commanding officer may appear, it will be ready for inspection.

m. Cleaning procedures should be carried out in such manner that they will disturb the comfort of the patient as little as possible and will not interfere with the treatment and care of the patient.

192. Care of property.—*a.* The utmost care must be taken in keeping the ward property in good condition and guarding it against loss. Any permanent installation in the ward broken or out of order should immediately be reported so that all utilities function perfectly at all times. Items of issue needing repair should be exchanged, through the medical supply, so that the property in the ward is serviceable at all times. Expendable items are obtainable through

requisition, usually once a week on a specified day, from the medical supply and should not be requisitioned in excessive amounts. Only the amount of each item necessary for 1 week should be asked for and then every effort should be made to prevent loss or breakage of these items. This particularly pertains to thermometers, which are often broken through carelessness and requisitioned in excessive amount.

b. A list of the nonexpendable property charged to the ward is furnished on a memorandum receipt. Constant vigilance and effort are required by the entire ward personnel to prevent loss of this property. A property inventory is taken once a month and any loss is reported at once.

c. Linen should receive special attention. Soiled linen is exchanged for clean linen daily and is counted both before it is sent to, and after it is returned from, the laundry. The wards in most of our military hospitals have a linen room in which the linen is stored and this room should be kept locked at all times. Soiled linen is kept in linen hampers, which are also kept in the linen room.

d. Bed patients should have their bed linen changed as often as necessary to give them comfort and a sense of cleanliness, while ambulant patients should have their bed linen, pajamas, and bath towels changed twice a week. Clean hand towels should be given to the patients at least every second day.

e. Stains on linen should be removed before sending to the laundry. Blood stains, when fresh, can be removed by soaking in cold water, followed by washing in warm, soapy water. Meat and egg stains can be removed in the same manner. Vomitus and feces can be removed by holding under cold running water and brushing and then washing in warm, soapy water. Iodine stains can be removed by soaking in a solution of sodium hyposulfite. Silver nitrate stains can be removed by applying ammonia and then washing. Ink stains can be removed by applying salt and lemon juice, laying in the sun, and then washing. Mercurochrome stains are removed by soaking in 20 percent chlorinated soda solution (Labarraque's solution) for 2 minutes, then adding 5 percent solution of acetic acid in an amount equal to one-fifth the volume of the soda solution.

193. Ward rules.—*a.* The head nurse or, in wards in which Army nurses are not assigned, the wardmaster of each ward is directly responsible to the ward officer, and will be in charge of the ward and the enlisted assistants and patients therein, and will be obeyed and respected accordingly.

b. The head nurse or, in wards in which Army nurses are not assigned, the wardmaster is responsible for the cleanliness and order of the ward and is responsible for the prompt delivery of prescriptions to the pharmacy, of medicines to the ward, and of the diet cards to the mess office.

c. In wards to which Army nurses are not assigned, the wardmaster is responsible for the administration of medicines and other treatment prescribed, the keeping of records, and all other duties that may be assigned to him by the ward officer. No enlisted men, except those authorized to do so in writing by the responsible medical officer, will administer medicine to a patient in a hospital, and then only as directed by the responsible medical officer and under such limitations as his written authorization shall prescribe.

d. Alcohol, alcoholic liquors, and narcotics, when necessarily on hand in the ward, will be kept under lock and key and every precaution taken to prevent their improper use. Disinfectants such as formalin, cresol, etc., and medicines for external use only, will not be kept on the same shelf or in the same medicine cabinet as medicines for internal administration.

e. On the death of a patient the wardmaster will notify the ward officer, or in his absence the medical officer of the day. He will not remove the body from the ward until after it has been examined by a medical officer.

f. The wardmaster will see that patients are acquainted with ward rules.

g. Before leaving the ward at the end of his daily tour of duty, the wardmaster will turn over to his relief all orders of the ward officer, accompanied by such explanation and instructions as may be necessary.

h. Upon reaching the ward patients will be promptly bathed, clothed in clean hospital clothing, and put to bed, unless their condition indicates otherwise or a specific order forbids.

i. Money and valuables found on patients will be disposed of in the prescribed manner. The commanding officer will not be responsible for money or valuables of patients not turned over for deposit in the hospital safe.

j. A clinical record will be carefully kept for each patient. Upon final disposition of the case this record will be completed and signed by the ward officer and turned in to the record office.

k. No information regarding the diseases or condition of patients under treatment will be given to anyone except those authorized under the regulations to receive it.

l. Visitors will be allowed to see friends in the ward at a specified time, when their presence will in no way disturb other patients.

m. Bed linen will be changed on occupied beds at least twice weekly, and oftener if necessary to insure cleanliness. Whenever a bed is to be occupied by a new patient, clean linen will be furnished. All bedding and clothing used by infectious cases will be promptly disinfected when removed from the beds. Patients will not occupy their beds when dressed in other than hospital clothing.

n. Loud noises, boisterous actions, the use of profane language, and gambling are forbidden in the wards, and no food, intoxicants, or other articles of food or drink, except as prescribed or authorized, will be brought into the wards.

o. Patients are forbidden to use towels, basins, toilet articles, eating utensils, or articles of clothing pertaining to another patient.

194. Admission and discharge of patients.—*a.* Patients are admitted to Army hospitals at the receiving office, where the necessary data for the initial form of the clinical record (W. D., M. D. Form No. 55a (Clinical Record Brief)) is obtained and recorded. This form is forwarded to the ward with the patient. In some of the larger hospitals, patients, if not too ill, are given a bath and furnished hospital clothing before being sent to the ward.

b. After arrival at the ward, the patient should be promptly attended by the nurse or ward attendant and should be treated with consideration and courtesy. He should be given a seat next to the nurse's or ward attendant's desk and made comfortable while the routine slips are made out and the temperature, pulse rate, and respirations are taken and recorded. If his condition permits, and in those hospitals where a shower is not given at the receiving office, he should be conducted to the bathroom where he should be instructed to take a tub or shower bath. During this procedure he should be furnished pajamas, bathrobe, bath towel, face towel, and slippers. Then he should be conducted to his bed.

c. Those patients who are too ill to take a bath, as shown by increased temperature over 100° F., by being brought to the ward on a stretcher or in a wheeled chair, or showing evidence of acute illness, pain, distress, discomfort, or injury, should not be sent to the bathroom until authority is obtained from a medical officer. These patients should be put to bed immediately, being disrobed by the nurse with the assistance of the ward attendant. The patients should be given a bed bath as soon as practicable. During the bathing process, the body should be inspected for the presence of skin lesions or vermin and evidence of contagious or infectious disease.

Anything unusual about the patient's body, or symptoms should be recorded and reported to the ward officer or the medical officer of the day.

d. In accordance with Army Regulations, a clinical record of every patient will be kept by fixed hospitals in time of peace or war, excepting those serving in a theater of operations. W. D., M. D. Form No. 55a and W. D., M. D. Form No. 55j (Clinical Record Treatment) will be used in every case; the other lettered blanks of the 55–series will be used as the nature or importance of the case may warrant. In most Army hospitals a complete record is kept, including forms 55a to 55j, inclusive, and the other Medical Department or local hospital forms, depending upon what laboratory or other diagnostic procedures have been requested and received.

e. On admission of a patient to the ward, the nurses or ward attendant will initiate such laboratory examinations as are required by standing orders of the ward officer. All other laboratory requests or diagnostic procedures must be ordered and signed by the medical officer. The nurse's bedside notes (W. D., M. D. Form No. 68) are usually of a temporary nature. They are not filed with the clinical record and may be destroyed or retained at the discretion of the commanding officer of the hospital.

f. At each ward is an Admission and Discharge Book in which the register number, name, status, and date of admission of each patient is entered. A bed card and two roster cards are also made out for each patient. The bed card, upon which is typed the register number, name, status, and date of admission, is kept at the foot of the bed by a bed card holder. The roster cards, upon which is typed the same data as upon the bed cards, are kept on ward directory boards upon which are the locations of the beds in the ward. These ward directory boards are kept in the ward surgeon's and the nurses' offices and should be kept up to date.

g. Any infectious case admitted should be isolated immediately and his clothes sent to the proper place for sterilization.

h. Valuables in most Army hospitals are taken up by the receiving officer and turned over to the custodian of the patients' fund, the necessary local form for receipt for valuables having been made out. If a patient is admitted to a ward with valuables, these should be taken up by the ward surgeon and turned over with the proper form to the custodian of the patients' fund for safekeeping.

i. Whether or not a patient is allowed to keep his clothing depends upon the rules and regulations formulated by the commanding officer of the hospital concerned. In most Army hospitals the patients are

required to turn in their clothing at the baggage room which is connected with the receiving office and they are furnished hospital clothing in return. They are allowed to retain two suits of underwear, two pairs of socks, a pair of shoes or slippers, and the necessary toilet articles.

j. Patients are discharged from the hospital when they have recovered from the disease for which they were hospitalized, when they are discharged on a certificate of disability, and when they are transferred to another hospital. They can be temporarily discharged in case of furlough or leave, at the expiration of which furlough or leave they return to the hospital. A case might also be terminated in case of death or in case of absence without leave or desertion. In case of discharge from the hospital, the clinical record should be brought up to date, all notations entered, all forms attached in the proper sequence, and the record sent forward 24 hours prior to the contemplated time of discharge of the patient. The main diagnosis and the date of discharge is entered opposite the patient's name in the ward Admission and Discharge Book.

195. Serving food.—*a.* One of the most important duties in the hospital and perhaps one that is frequently neglected is the serving of diets. Treating disease by diet therapy is just as important as treating by means of medication and in certain types of disease such as diabetes and peptic ulcer diet is probably more effective than medicine in controlling the symptoms and effecting a recovery. For the maintenance of life we must not only have the required amount of food but it must also consist of the properly balanced proportions of the food elements. These food elements consist of proteins, carbohydrates, fats, water, mineral salts, and vitamins.

b. Diets are classified as regular, light, soft, liquid, and special.

(1) The *regular* diet is the one served in the general mess and to certain patients in the wards.

(2) The *light* diet consists of one in which certain heavy foods and certain kinds of meat are restricted.

(3) The *soft* diet consists of foods which are very easily digested, with fluids in addition.

(4) A *liquid* diet, as the name implies, consists only of fluids such as broths, strained soups, strained gruels, fruit juices, milk, milk drinks, ice cream, tea, and coffee. The fluid intake of a patient might be forced or restricted.

(5) A few examples of *special* diets are the diabetic, Sippy, convalescent ulcer, salt-free, low residue, and high-vitamin high-caloric diet.

c. Silverware, cooking utensils, dishes, and glassware should be kept scrupulously clean. All dishes, including glasses and silverware, which come in contact with infectious or contagious cases should be sterilized by washing in boiling water. The silverware should be kept polished.

d. For the psychic effect upon the patient, the dishes served to patients should be as tempting and appetizing in appearance as possible. Painful emotions such as worry, anxiety, depression, fear, anger, and nervousness tend to inhibit the flow of digestive secretions and interfere with the proper digestion and assimilation of the food. Pleasurable sensations and emotions such as cheerful surroundings, the sight of appetizing and garnished dishes, and cheerful frame of mind tend to increase the flow of digestive secretions and aid in digestion. An important duty of the nurse or ward attendant in serving food to certain types of patients is to prevent, if possible, the painful emotions which inhibit digestion and to stimulate those pleasant emotions which aid digestion.

e. It is very important to serve hot food *hot*, preferably on warm dishes, and cold food *cold*, preferably on *cold* dishes. Meals should be served at regular intervals. This is extremely important in certain types of cases who require frequent feedings at regular intervals.

f. Ambulant patients in military hospitals are usually served cafeteria style in the general hospital mess. Bed patients, and semiambulant or convalescent patients are served on trays in the wards.

In some of the larger Army hospitals dietitians aided by mess attendants serve the ward patients. In many of the military hospitals, the serving of trays to patients in the ward is taken care of by the nurse and ward attendants.

g. Bed patients should be prepared for their meals 15 to 20 minutes prior to mealtime. This might necessitate giving the patient a bedpan or urinal followed by giving him wash water and brushing or allowing the patient to brush his hair. Most patients in hospitals look forward to mealtime unless they are too ill. The serving of meals is one of the things which has a tendency to break the monotony of the day. Bed patients should be arranged comfortably with pillows or by raising the head of the bed. The condition of many patients is such that they should not be allowed to exert themselves unduly. This type of case will have to be fed by the nurse or ward attendant. Fluids can be given to a strictly bed patient by drinking tubes or a spoon. *A delirious patient should never be given fluids by a glass drinking tube.* Many semiconscious patients can be given fluids slowly by a spoon. The touch of the spoon on the lips and

tongue stimulates the swallowing reflex. In these cases, food or fluids should be given very slowly and one must be positive that the food enters the esophagus and not the larynx.

h. The trays used in serving patients should be thoroughly clean. The various dishes served should be neatly arranged and all the necessary utensils should be present. If salt, pepper, sugar, and cream are allowed, they should also be present. The tray should be inspected before it leaves the diet kitchen for neatness, cleanliness, proper menu, and identification. Trays should immediately be removed from the ward after the patient has finished his meal.

i. Prescribed diets, particularly a diabetic diet, should be entirely consumed by the patient without any substitution. Medication should not be taken with the meals unless specifically ordered. A period of quiet and rest after a meal is desirable.

196. General nursing care and comfort of patient.—*a.* Nursing is the art or science of caring for the sick and wounded. Nursing objectives in general include the promotion of health, the prevention of disease, the cure of disease, the restoration to health, and the comfort of the patient. In nursing or treating patients in the hospital we are primarily interested in the care and comfort of the patient, the goal being the cure of the disease and the restoration to health.

b. The mental attitude of the patient has a marked influence on his condition. Every effort should be made to keep him contented and in a cheerful frame of mind. It is also necessary that he should have confidence in those attending him, including the medical officers, nurses, and ward attendants. His mind should be allayed so that he does not worry about his condition. To comfort is to strengthen, support, invigorate, refresh, gladden, cheer, and give relief from pain and trouble. The patient's recovery will depend to a great extent upon the patient's comfort, this in turn being dependent upon the general nursing care. Mental and physical relaxation, which are the results of comforting the patient, are therapeutic aids in restoring the patient to health. To make the patient comfortable, contented, and happy is one of the chief duties of the nurse or ward attendant and it is essential in successfully treating the patient.

c. Physical causes of discomfort in illness includes cramped and strained positions; weight and pressure on sensitive parts, such as the weight of the arms on the chest or the weight of the bed clothes; rubbing and chafing from such causes as restlessness, moisture, or temperature; interference with bodily function, including sleeplessness, thirst, indigestion, constipation, diarrhea, nausea, and vomiting; lack of cleanliness resulting in irritation of the skin and itching; pain

and unskillful handling. The causes of mental discomfort are numerous, the main ones being homesickness, financial worries, apprehension, fear of pain, uncertainty, exposure, lack of privacy, confusion, and noise. It is one of the main duties of a nurse or ward attendant to be cognizant of the causes of discomfort, so that he or she might be more able and skilled in providing for the care and comfort of the patient.

d. The following procedures tend to add to the comfort of the patient and should be taken into consideration when caring for patients: bathing; attention to the mouth and teeth; proper care of the back and buttocks, so as to prevent bedsores; serving of meals at regular intervals; rest; attention to the morning and evening toilet; attention to elimination, furnishing bedpans and urinals when required; frequent changing of the position of the patient; avoidance of drafts; avoidance of bright lights; and prevention of noise. Undue noise is wearing and distressing to the sick. Medical officers, nurses, and ward attendants should endeavor to prevent unnecessary noise. Bedpans when placed under patients should be warm.

e. A nurse or ward attendant should always be assured that the patient is taken care of and should never wait for a signal from the patient. If signaled, this signal should be answered without delay. The routine work placed upon attendants in the wards, although very important, should never permit them to forget that their first duty is the care of the patient.

197. Temperature.—*a.* The normal temperature of the body when taken by mouth is considered to be 98.6° F. (37° C.), but the normal temperature may vary slightly, depending upon the time of day that it is taken. The temperature might be a little lower in the early hours of the morning than during the day and it may be slightly higher after meals than before meals. The axillary temperature is approximately 1° lower and the rectal temperature approximately 1° higher than when taken by mouth. A variation of temperature below 97.5° F. or above 99° F. may be regarded as abnormal and an indication of disease. Abnormal temperature may be subnormal or elevated.

b. Subnormal temperature is often seen in cancer, nephritis, uncompensated heart disease, myxedema, shock, heat exhaustion, and wasting diseases. It is a rough measure of the degree of prostration. Subnormal temperatures occasionally are present in health.

c. Fever or an elevation of temperature above 99° F. is found in many diseases. After childhood the vast majority of fevers are found to be due to infectious diseases or inflammations of any type, toxemias without infection such as exophthalmic goiter, disturbances of the heat

regulation such as in sunstroke, and occasionally after hemorrhage. A temperature of 100° to 101° F. is regarded as low fever; 101° to 103° F. as moderate fever; 103° to 105° F. as high fever and over 105° F. as hyperpyrexia.

d. Fevers are classified as continued, remittent, or intermittent. A continued fever is one in which the temperature is continually above normal, and there is a difference of not more than 1° between morning and evening. In remittent fever there is a decided drop some time during the 24 hours, but the temperature does not reach normal. In the intermittent fever (sometimes called hectic or septic) the temperature at certain intervals falls to or below normal.

e. The results of the temperature readings are recorded on W. D., M. D. Form No. 55h (Clinical Record Temperature, etc.). The temperatures of patients in the hospital are taken at the intervals ordered by the medical officer in charge. Unless otherwise stipulated it is taken and recorded in the morning and afternoon. The pulse and respiratory rates are taken and recorded at the same time. On very ill patients, the temperature, pulse rate, and respirations are taken four times daily. On ambulant convalescent patients one temperature recording each day is usually sufficient. If a graphic chart of the temperature curve is desired, it is recorded on W. D., M. D. Form No. 55i (Clinical Record Temperature, etc., Graphic).

f. Fevers may terminate in one of two ways. By crisis, when the fever drops suddenly to normal, never again to rise to any considerable degree unless a relapse or a complication sets in, or by lysis when the fever gradually declines until it reaches normal. Most fevers terminate by lysis. Examples of diseases which may terminate by crisis are pneumonia, influenza, and typhus fever.

g. The instrument for measuring the temperature of the body is called a clinical or self-registering thermometer. The thermometer consists of a glass bulb containing mercury, and a stem in which the column of mercury may rise. On the stem is a graduated scale representing degrees of temperature, the lowest degree registered being 95° F., the highest being 110° F. When the mercury column has risen above the normal line, which is usually indicated by an arrow, it must be shaken down by a sweeping motion of the arm before the thermometer is used again. The Fahrenheit scale is usually employed in this country, while the Centigrade scale is employed in European countries.

h. Temperatures are ordinarily taken in the mouth, the bulb being placed under the tongue, and the patient directed to close his lips but not his teeth, upon it. If the patient is very weak it may be necessary

for the nurse to hold the thermometer in his mouth. With modern thermometers 3 minutes is ample for mouth temperatures. When the patient is delirious or unconscious, or is a child, it is not safe to take the temperature by mouth.

i. In infants and children the temperature is usually taken in the rectum. The bulb is well oiled and then introduced about 2 inches into the rectum and allowed to remain there for about 3 minutes. The rectal temperature is considered the most reliable and the most accurate estimation of the body temperature.

j. To take the temperature in the axilla, the arm pit is first wiped dry, the bulb put in place, and the arm carried across the chest as to bring the opposing skin surfaces in close contact with the thermometer. To obtain an accurate axillary temperature, the thermometer must remain in position 10 minutes.

k. Thermometers should be rendered scrupulously clean and free from infection after use. Clinical thermometers when not in use should be kept completely immersed in a two percent solution of phenol. Approximately 1 hour before they are required for use, they should be removed from the phenol solution thoroughly rinsed in cool water, and then completely immersed in 70 percent alcohol. Small thermometer trays are the containers usually used for this purpose. The thermometers are kept in the 70 percent alcohol until required for use, at which time they are removed and thoroughly wiped with cotton before placing in the patient's mouth. Upon removal of the thermometer from the patient's mouth, the temperature should be noted and recorded; the thermometer should be washed with soap and water and again placed in the phenol solution. This procedure should be repeated after each successive patient.

198. Pulse.—*a.* The pulse is the distention or pulsation of the arteries produced by a wave of blood forced through them by the contraction of the left ventricle of the heart. This expansion of the walls of the arteries happens at the same time as the heartbeat and is wave-like in character.

b. By pulse rate is meant the number of beats to the minute counted at any point of an artery's course where it may be seen or felt. The normal pulse rate in the adult male is 65 to 80, and in the adult female 70 to 80 beats per minute. The pulse is more frequent in the standing position than when lying down or sitting and is increased by exercise. In children it is much more rapid. Conditions which increase the heart action and pulse rate are fever, excitement, anger, injury, cold, and certain drugs. Conditions which depress the pulse rate include worry, shock, collapse, some toxins or poisons, and certain

drugs, such as alcohol and ether. The condition of the pulse is very important, as it usually accurately indicates the condition of the heart and vital organs. A simple quickening of the pulse rate of 100 or over is known as *tachycardia*. It may be physiological, or may be caused by organic pathology. If the heart rate and pulse rate are slow, below 50 per minute, the condition is called *bradycardia*. This also may occur in normal individuals, or it may be due to conditions such as, exhaustion, toxemia, jaundice, certain heart conditions, certain mental conditions and cerebral hemorrhage.

c. The pulse may be taken by laying the fingers gently on any superficial artery, but the locations most frequently used are the radial artery, at the wrist; the temporal artery, in front of the ears; the cartoid arteries, in the sides of the neck; the facial arteries, where they pass over the lower jawbone just in front of the angle of the jaw; and the dorsalis pedis artery, on the dorsal surfaces of the feet.

d. The points to be noted when taking the pulse rate are the frequency, the rhythm, the condition of the wall of the artery, compressibility, and tension. The tension can be measured fairly accurately by the force with which the pulse strikes against the finger. The degree of pressure necessary to obliterate the pulse, that is, to prevent the pulse wave from going further along the artery gives us the compressibility of the artery. The blood pressure depends upon three factors—the elasticity and contraction or relaxation of the arteries, the volume of the blood, and the force of the heartbeat. The blood pressure is accurately measured by means of the sphygmomanometer or blood pressure apparatus. The blood pressure is taken by listening over the brachial artery just below the cuff of the blood pressure apparatus which is placed around the upper arm. This cuff is inflated and then the column of mercury allowed to fall slowly. The point where the tapping systolic sound first appears is known as the systolic pressure and the point where the sound suddenly changes from a sharp tap to a dull feeble thud is known as the diastolic pressure. The average readings in healthy adults vary between 110 and 135 millimeters of mercury for the systolic pressure, and between 60 and 90 millimeters of mercury for the diastolic pressure. The pulse pressure is the difference between the systolic and diastolic pressure readings.

e. The beats of the normal pulse are almost equal in force and are separated by intervals of almost equal length. In disease there might be an irregularity of the pulse in force or rhythm or both. Irregularity in force means that the beats are not all of equal strength. Irregularity in rhythm means that the intervals between

the beats are not all of equal length and the beats do not follow in regular succession. An intermittent pulse is one in which a beat is missed at regular or irregular intervals.

199. Respiration.—*a.* The normal respirations occur at the rate of about 18 to the minute. In disease there occurs a marked variation in the frequency and character of the respirations; in narcotic poisonings the respirations are very slow, while in many diseases involving the lungs they are very rapid.

b. In taking respirations one should notice their frequency and regularity, whether difficult or easy, noisy or quiet, deep or shallow, and whether the same on the two sides of the chest.

c. Cheyne-Stokes respiration is that peculiar type of breathing which occurs in certain diseases of the heart, kidneys, or brain. The respirations gradually increase in frequency and intensity up to a certain point, then slowly decrease until they seem to cease entirely; after a short pause the same cycle is repeated. In stertorous breathing there is a loud snoring noise with inspiration. Dyspnea is difficult breathing usually accompanied by sound. Edematous breathing is characterized by loud, moist, rattling rales, caused by air's passing through the moisture in the air sacs of the lungs.

d. In recording respirations it must be remembered that they are in a measure under control of the will, therefore, they must be counted without the patient's knowledge. This is done by laying the arm across the chest while taking the pulse and then, without removing the fingers from the wrist, count the respiration. With a little practice an attendant should become so expert that he can take the pulse and respiration of a sleeping patient without arousing him.

e. In the normal individual the temperature, pulse, and respiration rates have a definite relationship, and the three factors should always be considered together in disease, since a disturbance may have a very important meaning. In health the pulse rate is about four times the respiratory rate. When the respiratory rate is increased to a third or a half of the pulse rate, it is usually an indication of disease of the lungs, such as pneumonia.

200. Symptoms.—*a.* One of the most important duties of a nurse or ward attendant is to cultivate the habit of observing symptoms accurately and reporting them clearly and intelligently.

b. The physician can be with the patient only a short time. He must depend upon the nurse or ward attendant to inform him of everything that takes place in his absence; they may obtain and impart information of the greatest value in diagnosis and treatment.

Symptoms may be divided into two classes—*Subjective* symptoms, those which are apparent to the patient himself, such as pain, and *objective* symptoms, those which are apparent to others, such as redness and swelling. Sometimes the symptoms are feigned; then the patient is said to be malingering. It is always safer to assume, however, that the symptoms are real until the contrary is proved.

c. Not only must the nurse or ward attendant cultivate the habit of observing symptoms, but they must learn to attach to them their relative importance. Emergencies continually arise when they must determine what is to be done as whether the symptoms are of sufficient gravity to cause them to send for the ward officer.

d. The observations should commence with the giving of the first bath or putting the patient to bed.

(1) Are there any scars, wounds, or eruptions upon the body? Is the patient emaciated or dropsical? Does he appear weak and ill? The attitude and expression are sometimes characteristic. In inflammation of one lung the patient lies on that side so as to give free play to the uninjured lung. In appendicitis or peritonitis he is apt to lie on his back with one or both legs drawn up.

(2) Slipping down toward the foot of the bed means weakness and therefore is an unfavorable sign.

(3) With colic, the patient often lies on the abdomen with a pillow pressed against it, but when the pain is inflammatory he cannot stand the pressure.

(4) When the patient cannot breathe while lying down, there is usually trouble with the heart or lungs.

(5) Great restlessness is often a bad sign.

(6) An anxious look is unfavorable, while a tranquil expression is of the opposite import.

(7) Rattling in the chest with shortness of breath and bluish tint of the lips is a sign of edema of the lungs and often indicates approaching death.

(8) The mental condition gives important indications—whether the patient is conscious or unconscious, rational or irrational, depressed, excited, or muttering. The speech may be thick, clear, or hoarse.

(9) Concerning the eyes, note whether the pupils are dilated, contracted, or unequal and whether there is any squinting or yellowness or congestion of the conjunctivae.

(10) The hearing may be acute or it may be defective; there may be a discharge from the ear.

(11) Bad taste may be a complaint.

(12) The skin, especially of the face, may give important indications; it may be pale, flushed, livid, or jaundiced; hot, cold, dry, or moist. A moist skin with high temperature is usually a bad omen. A peculiar red spot high up on either cheek may be indicative of pneumonia or tuberculosis; pallor about the lips is a sign of nausea. One may find the waxy hue of Bright's disease, and the rashes of the eruptive fevers, the sallow color of narcotic users, the pallor of anemia, the blue tint of cyanosis, the bronzing of Addison's disease. Bluish spots, about the size of a fingernail, distributed about the trunk are often indicative of vermin infestation.

(13) The tongue offers many valuable indications; note whether it is dry or moist, clean or coated, large or small, bitten, or indented on the edges by the teeth. In malarial fevers and digestive disorders the tongue is apt to be heavily coated, but soon becomes dry and cracked; when such a tongue becomes moist and begins to clean up from the edges, it is a very favorable sign. In scarlet fever the bright red papillae showing through the white fur produce the characteristic strawberry tongue. In yellow fever the tongue is small, red, and pointed.

(14) Note at the same time the condition of the mouth and teeth; white, slightly raised patches on the inside of the lips and cheeks, at the corners of the mouth, and in the throat are frequently mucous patches, a sign of syphilis. The dark accumulations which occur on the teeth in fevers are known as sordes; their presence indicates that the mouth has not been well cared for.

(15) The odor of the breath is often significant—sweet in diabetes, urinous in uremia, fetid in disorders of the stomach, gangrene of the lungs, bad teeth, etc.

(16) The state of the appetite is of importance; it is usually lost in acute diseases, but occasionally is excessive. Observe with care how much food the patient actually takes. Nausea is often present with or without vomiting. The frequency of the vomiting, whether it is painful, and the character of the matter vomited should be noted. Usually the vomitus consists of food at first, but this may be followed by bile, mucus, or blood. When the blood has been retained in the stomach some time it becomes brownish in color, like coffee grounds; vomitus of this character is seen in yellow fever. Vomiting of fecal matter is a sign of great importance, and indicates obstruction of the bowels. Marked thirst is usually an indication of fever or hemorrhage.

(17) The number and character of the stools should be noted; in jaundice they are generally clay-colored; bismuth and iron color them

black; they may be liquid or solid, and may contain mucus, pus blood, or worms.

(18) Tenesmus, a constant desire to evacuate the bowels, is present in dysentery.

(19) Belching of gas, rumblings in the bowels, and distention of the abdomen are signs to be noted.

(20) The urinary functions should be carefully measured. In both suppression and retention, no urine is passed, but in the former, which is much the more serious condition, no urine is secreted; it may be distinguished from retention, which is caused by some obstacle to the escape of urine from the bladder, by the fact that in suppression the bladder may be shown to be empty by tapping with the finger just above the pubis; a hollow sound is produced if the bladder is empty.

(21) Incontinence of urine, that is, the inability to hold it, may be associated with retention, so that constant dribbling does not preclude the possibility of the bladder's being distended.

(22) The quantity of urine should be measured and the frequency with which it is passed noted. Useful information may be also obtained from observation of its color and odor. Blood gives it a smoky or reddish hue, pus a milky appearance, and mucus a stringy appearance. Bile imparts a greenish tinge, as does carbolic acid, while santonin gives a bright yellow color. Many drugs and vegetables impart a characteristic odor to urine.

(23) Cough is an indication of some irritation of the air passages; the matters coughed up are called sputa. When there is no sputum, the cough is said to be dry. The cough may be tight, loose, or painful; there is the hoarse, crowing cough of croup or diphtheria, the spasmodic whoop of whooping cough, the wheezing cough of asthma, the painful cough of pleurisy and the peculiar rasping cough of aortic aneurism. The character of the sputum varies—in bronchitis it is white or yellow and mucous; in pneumonia it is reddish or prune juice in color; in tuberculosis it is at first mucous and frothy and later purulent with cheesy nodules, and sometimes stained with blood.

(24) In gangrene of the lung the sputum is unbearably offensive, while in lung abscess it may or may not be offensive.

(25) Hiccough, when it is persistent in the later stages of acute diseases, is often a very grave sign.

(26) When a patient complains of feeling cold, take his temperature; a chill is nearly always accompanied by fever. Chills frequently accompany the onset of acute diseases; when they occur in the course of inflammation they often indicate suppuration.

(27) Hemorrhage from any part of the body is always significant.

(28) Pain is one of the most valuable signs which we possess, as it often points toward the location of the disease. The kind of pain should be described and whether it is constant or intermittent, severe or slight. Exaggerated sensitiveness to touch is called hyperesthesia and diminished sensibility anesthesia, the latter being often associated with loss of muscular power or paralysis. Paralysis of the lower half of the body is called paraplegia, and of a lateral half, hemiplegia.

(29) Disorders of motion include picking at the bedclothes, always a bad sign, twitching of the tendons (subsultus), slight spasms, and local or general convulsions. In convulsions always note the parts affected and whether the attack is attended with loss of consciousness.

(30) Under disorders of consciousness are included delusions and hallucinations, delirium, stupor, and coma. The character of the delusions should be noted, whether occasional or habitual, quiet or noisy; in stupor note whether the patient can be aroused; if he cannot, it is coma, a very serious condition. Coma vigil is a combination of sleeplessness, with partial unconsciousness, and is always a symptom of bad omen.

(31) The amount and character of sleep should be recorded; patient's statements on this point must be accepted with caution.

e. The nurse's observations are recorded on W. D., M. D. Form No. 55j, which in turn becomes part of the permanent hospital record of the patient in question.

201. Collection of specimens.—*a.* Collection of specimens is one of the important duties of a ward attendant. They should be collected in the correct manner, and sent to the right place in the laboratory at the proper time. In most Army hospitals it is customary for the night ward attendants to collect the routine specimens, such as urine, feces, and sputum, the first thing in the morning and take them to the laboratory as they go off duty.

b. Specimens are examined by chemical, bacteriological, and microscopic methods and the results of these examinations give the medical officer very valuable information. This information is useful in arriving at a diagnosis and also valuable in following the progress of the disease. It is necessary to have the specimen well labeled and to have the proper laboratory slip attached.

c. There are several designations for urine specimens, such as routine specimen, 24-hour specimen, day specimen, night specimen, and sterile specimen. The routine or single specimen, is routinely obtained from every patient admitted to Army hospitals. It is obtained in the morning, passed directly into the proper container,

and at least 4 ounces are sent to the laboratory. Occasionally it is desirable to save the entire amount of urine passed in 24 hours. At least a 4,000-cc. container should be used for this purpose. A definite hour in the morning for the first voiding should be fixed, the first urine being discarded. All urine passed during the next 24 hours including that which can be passed at the end of the period should be saved, properly mixed, and measured. At least 4 ounces of this should be sent to the laboratory after marking on the proper slip the amount and the notation "24-hour specimen." Occasionally the urine is divided into day and night specimen, the day specimen consisting of all urine voided in the 12-hour period from 7:00 AM to 7:00 PM and the night specimen being collected from 7:00 PM to 7:00 AM. A portion of these specimens are likewise sent to the laboratory after placing on laboratory slip the amount and the proper notations, "day urine" and "night urine."

d. Specimens of feces are usually obtained the first thing in the morning, the specimen being sent to the laboratory in special feces bottles and accompanied by the proper laboratory slip. Occasionally specimens are placed in sterile containers, such as a sterile test tube or a sterile Petri dish. If amoebiasis is suspected it is desirable to keep the stool at body temperature. In these cases the specimens should be sent to the laboratory without delay.

e. Sputum specimens are usually collected in the paper sputum cups. The sputum which is coughed up from the lungs the first thing in the morning is usually the most desirable specimen. In some hospitals small wide-mouthed bottles are used to collect sputum specimens. It is advisable to have the patient rinse out his mouth with warm water before obtaining a specimen. If sterile specimens are ordered, the patient should cough and expectorate into a sterile Petri dish. Care should be taken so that the sputum is not deposited on the outside of the container. Care should also be exercised so that the hands are not soiled and they should always be washed after handling specimens.

f. Other specimens which might be obtained are spinal fluid, fluid aspirated from the chest or peritoneal cavity, stomach contents, specimens of pus in cases of infection, and throat cultures. These specimens are obtained by either a trained technician or a medical officer.

202. Beds.—*a.* The hospital bed is higher and narrower than the average bed found in the home, and this fact contributes greatly to the efficiency of the care and treatment of the patient, as it makes it easier for the attendant to care for the patient. The regulation hospital bed is of white enameled iron with an iron spring. In

addition there is the surgical bed which is adjustable so that the head or feet might be elevated or lowered.

b. There are two mattresses listed in the standard supply table, the inner spring mattress and the cotton mattress. Mattresses must be smooth, without lumps or hollows, and must be firm, not loose or sagging. The mattress should always be protected with a linen or cotton mattress cover made to fit the mattress as closely as possible, so as to prevent soiling. Mattress covers should be changed frequently. Two pillows are allotted to each bed, often one hard hair pillow and one soft feather pillow. The mattress and sheets of beds for strictly bed patients are protected by a rubber draw sheet which should extend from several inches under the lower edges of the pillows to several inches below the knees, and should be long enough to tuck under the mattress about 8 inches on either side. As rubber should never be allowed to come in contact with the patient, the rubber draw sheet is covered with a cotton draw sheet, which should extend about 2 inches above and below the rubber draw sheet.

203. Bed-making.—*a.* Making a bed properly for the sick is an art and one worthy of much practice in order to accomplish it. The manner in which it is made not only can make or mar the whole appearance of the ward, but also can make or mar the patient's comfort and therefore hasten or delay his recovery. As the patient spends most of his time in bed, his comfort is largely dependent upon it.

b. There are certain principles to remember in bed-making.

(1) Have all necessary articles on hand before making or unmaking a bed.

(2) Proceed systematically.

(3) Work quietly. Avoid jarring the bed, or walking around it more than necessary.

(4) Avoid stumbling against the legs of the bed.

(5) Do not place soiled linen on the floor.

(6) Avoid exposure of the patient. Place screens around the patient.

(7) Blankets should be of light weight.

(8) Use a bed-cradle to relieve the patient from weight of bedclothes when necessary.

(9) Beds must be made comfortable and free from wrinkles; it must be kept so.

(10) Cleanliness of linen is essential; coverings must be kept straight.

(11) The finished bed must not be spoiled by untidy surroundings.

c. The bed linen of an occupied bed may be changed easily by a single attendant unassisted, and without seriously disturbing the patient. To change the lower sheet, first loosen all the bedclothes at top, sides, and the bottom, remove all the upper coverings except a sheet and blanket and roll up the bottom sheet lengthwise, together with the draw sheet, into a tight roll close to the patient's body; then in a like manner make one side of the clean sheet and draw sheet into a roll and place it alongside the first roll, tucking the free edges under the mattress. Now stand on the other side of the bed and with both hands turn the patient on his side with his face toward you; tuck in the rolls under his back, turn him back on his other side onto the clean sheet then withdraw the soiled one and pull the clean sheet into place. To remove the upper bed clothing, the covers should first be loosened as before, then spread the clean sheet and blanket over them and tuck in at the sides, after which the soiled clothes may be drawn out at the foot.

d. Bed linen should be changed whenever it is soiled, when a patient is discharged, and at least twice a week, depending upon the nature of the case. In infectious cases it should be changed daily.

Section II

MEDICAL PROCEDURE

Paragraph

204. **Baths.**—Baths are of several types and given for several purposes.

a. Cleansing bath.—(1) A cleansing bath may be in form of shower, tub, or sponge bath, depending upon the condition of the patient and the nature of his illness. A cleansing tub or shower bath is usually given to patients who require little or no assistance in bathing, but may be given to other types of patients if so ordered. A sponge bath, or bed bath as it is sometimes called, is given to patients who are unable to help themselves and who are confined to bed.

(2) A cleansing bath is given to promote cleanliness by removing dirt and skin secretions. This aids elimination of waste products by keeping the pores of the skin open, helps prevent bedsores, and is generally refreshing to the patient. At least one bath a day is necessary for an ill patient and in many cases two or more cleansing sponge baths a day may be advisable. Convalescent patients should bathe at least three times a week.

(3) When a sponge or bed bath is given, the bed should be protected with a rubber sheet covered with a cotton sheet. Only one part of the body is exposed at a time. This part is washed and then well dried before the bathing of another part is begun. The work is done quickly but carefully and special care should be paid in washing and drying between the fingers and toes, between folds of flesh, around the umbilicus and about the pubic region. The washcloth should be well wrung out and an excessive amount of soap should not be used. If possible, when washing the hands and feet immerse them in the vessel containing the bath water. The temperature of the water should not be greater than 96° F.; to maintain this temperature it may be necessary to add hot water from time to time. The room should not be below 72° F. and should be free from draughts. All clean linen and clothing should be within easy reach before the bath is begun. If patient is seriously ill and hard to move, a heavy bath towel may be used under the part being bathed and the protecting cotton sheet may be omitted. In giving the bath, start with the face, neck, and ears and work down the body.

b. Therapeutic bath.—Baths other than for cleansing purposes are given only upon order of the ward officer. These therapeutic baths are either hot or cold and may be very important in the proper nursing of patients. The reason for these baths is to promote a change in blood distribution and amount present in different areas, and for a local or general change in body temperature. Heat causes the peripheral circulation to speed up and the area becomes flushed and warm, perspiration is increased, and the temperature is raised. When cold is applied the opposite happens, that is, the peripheral circulation slows, the skin becomes pale and cold, perspiration is stopped, and the temperature is decreased.

(1) *Hot bath or hot pack.*—(*a*) Hot baths and hot packs are usually used to relieve excitement and to produce sweating or relaxation. Care must be taken to avoid burning patients, to prevent fainting and collapse, to prevent chilling, and to avert headaches. Feeling of

dizziness or faintness, increase in pulse rate, and weakness of the pulse are signs of undesirable effect, and if the changes are pronounced the treatment should be discontinued and the ward officer notified.

(b) Hot baths and hot packs are given principally to induce perspiration and to relieve muscular tension.

(c) The articles necessary for giving hot packs are an ice cap, four blankets, one towel, a foot tub lined with a rubber sheet in which to carry blankets wrung out of very hot water, five hot-water bags, pitchers of hot and cold water, a water glass and drinking tube, and a large rubber sheet.

(d) Soak two blankets in water at 150° F., leaving one corner of the upper and lower edge of each blanket out of the water (these corners should be diagonally opposite each other, as the blanket will then, when stretched, be somewhat on the bias); wring each blanket separately (two attendants are required, each taking a dry corner and twisting in opposite directions until the blanket has been wrung dry). Place the blanket in the foot tub lined with a rubber sheet covering hot-water bags, and repeat the process with the second blanket; carry the blankets to the bedside while the rubber sheet is still folded over them; pass two dry blankets with rubber sheet between under the patient; remove the pajama suit; wrap the patient in the dry blanket upon which he is lying; and turn the upper bedclothes over the foot of the bed. Place one hot blanket under the patient and one over him; fold the rubber sheet over the wet blankets; pull up the bedclothes, placing a towel around the patient's neck; apply an ice cap to the head and hot-water bags to the hips, arms, and feet. Watch the patient's pulse and encourage him to drink freely, unless directed to the contrary. The usual duration of this pack is 20 minutes.

(e) During and after removing a hot pack take the pulse at the temporal artery frequently; give plenty of fluids while the patient is in the pack; watch for collapse, in which case discontinue the pack and apply external heat; remove the wet blankets under cover of a dry one, thus avoiding exposure; wrap the patient in a dry blanket and leave an ice cap applied to the head and a hot-water bag to the feet. Draw up the bedclothes and let the patient remain between blankets for 1 hour, at the expiration of which time dry the patient and give him an alcohol rub.

(2) *Sedative bath.*—(a) The sedative bath is for the purpose of quieting and inducing sleep; it may be continued for hours or even

days; the temperature of the water is usually just below that of the body—about 96° F.

(*b*) The arrangement is practically the same as for the Brand bath, described in (6) below. Hot water must be carefully added from time to time to maintain a uniform temperature.

(3) *Sweat bath.*—To produce sweating or relaxation, hot-water, hot-air, or steam baths are used.

(*a*) The hot-water bath is given in the tub in the ordinary way except that the head is kept cool by cold cloths or an ice cap. Care must be taken not to continue the bath too long, to the point of fainting; 15 to 20 minutes is sufficient, after which the patient is taken out and, without drying, placed on hot blankets and covered by three or four more which are wrapped closely about him, up to the neck. Hot weak tea or hot water is given freely to encourage sweating. After about an hour the blankets are gradually removed, and the patient sponged off, under the last one, with alcohol and water, this being followed by a brisk rub with dry towels.

(*b*) Hot-air and steam baths may be given to a patient who is in bed or sitting up.

1. In the first method the bed is covered with a rubber sheet, upon which is placed a blanket on which the patient lies stripped. Over his body are placed two or three bed cradles or extemporized bed cradles. Bed cradles may be extemporized by tying together at right angles two half barrel hoops. Over the cradles and tucked in about the patient's neck is another rubber sheet and blanket. When electric light current is available, the simplest and safest method, and the one usually employed, is to suspend several light bulbs from the cradle frame and connect the bulbs with the lighting circuit by means of an extension cord. With the patient securely closed in, the air in the confined space about him quickly becomes heated the moment the current is turned on. In the absence of an electrical installation other methods may be resorted to. At the foot of the bed is placed an oil, gas, or alcohol heater with a section of stove pipe and an elbow to conduct the heat under the bedclothes, or, if steam is to be used, upon the heater is set a tea kettle with a hose attached to the spout for the same purpose. After the steam or hot air has passed in long enough to get perspiration well started, the upper rubber sheet and the

cradles are removed and the blankets tucked in closely around the patient's body after which the case is managed in the same manner as the hot-water bath.

2. To give these baths to a patient sitting up, after all clothing is removed he is made to take his seat upon a chair with perforated bottom; under the chair is placed an oil or alcohol lamp, an electric heater, light bulbs, or a pail of water in which are dropped hot stones or bricks. The patient is then surrounded from the neck downward by a rubber sheet and blankets arranged in the manner of a tent; this is a convenient method in the field, and for reclining patients a litter may be rigged up in the same fashion.

3. The following precautions are to be used with hot-air or vapor baths:

(a) Be careful not to burn or exhaust the patient, or to set fire to the bed.

(b) Keep an ice cap on his head.

(c) Watch the pulse.

(d) Give hot drinks freely.

(e) Wrap the patient in a hot, dry blanket for an hour after the bath, then rub the patient with alcohol.

(4) *Foot bath.*—(*a*) Foot baths may be given with the patient either in the sitting position or in bed. They are employed in sprains to control the hemorrhage about the joint, and in internal diseases to draw away the blood from the congested part. For the latter purpose mustard is usually added to the hot water.

(*b*) To give a mustard foot bath in bed turn up the covers from the foot end of the bed, place a rubber sheet across it, and on this a pail or foot tub full of water, the temperature of which should be between 108° to 112° F. Dissolve a couple of tablespoonfuls of mustard in a cupful of hot water until a uniform cream is formed, and stir it into the pail of hot water. If the dry mustard is added to the pail of water without previous solution, particles of mustard will float around, and may adhere to the legs and produce blisters.

(*c*) When all is ready the patient, lying on his back, should flex his legs and immerse them in the hot solution for 20 or 30 minutes. The legs are then withdrawn, dried quickly, and wrapped in a blanket.

(5) *Sitz bath.*—The Sitz bath is another form of local bathing; the temperature of the water is the same as for a foot bath. The thighs and trunk of the body are immersed to the waistline. The duration of the bath is 5 to 10 minutes.

(6) *Cold bath.*—(*a*) Cold baths are given for stimulation of the vital processes, namely respiration, circulation, relief of congestion, stimulating or quieting of the nervous system, and for reducing temperature.

(*b*) In giving cold baths the patient should be watched for evidence of intense shivering, cyanosis (blueing of the lips, ears, fingernail beds), and increasing pulse rate, as these signs are evidence of ill effect and the bath should be stopped immediately and the ward officer notified.

(*c*) Cold tub baths are known as the Brand system of bathing. A portable bath tub on wheels is generally employed. The tub is brought to the bedside half filled with water at a temperature of about 90° F.; the naked patient is lifted from the bed and lowered into the tub feet first, and gradually, so as not to produce too much shock. For the purpose of lifting the patient from the bed and supporting him in the tub, an open-work stretcher, a hammock, or a cotton blanket with loops sewed in the edges is usually employed. In the absence of these a binder 18 inches wide should be fastened across the head of the tub to support the patient's head and shoulders. His head rests upon a circular air cushion and is kept covered with cold compresses; pieces of ice are added to the water so as to reduce temperature gradually to about 70° F. To ascertain the temperature accurately, a bath thermometer is employed. All the time the patient is in the bath the attendants should keep up a vigorous rubbing of his body. The duration of the bath as ordinarily advised was about 20 minutes, but such lengthy exposures are no longer considered advisable. Cold baths should generally last no longer than 5 minutes.

(*d*) When it is time to take the patient out, the tub is covered with a dry sheet, which is wrapped about the patient as he is lifted out and placed on a dry blanket. If shivering persists, a hot-water bag may be applied to the feet and a hot drink may be given internally, but the patient should not be wrapped in blankets. The temperature is taken in the rectum immediately after leaving the bath, and again an hour later. Ordinarily the bath is repeated whenever the temperature registers 102.5° to 103° F.

(7) *Cold pack.*—When the patient does not stand the cold tub bath well, or is too weak to bear moving, the cold pack may be employed. In this method the bed is protected by a long rubber sheet, and two sheets folded one or more times and wrung out of water at 70° F. are used. One is placed under the patient and the other over him and tucked in closely about the body and neck; or a single

sheet may be used, enveloping the entire body except the head. The packs are changed about every 15 minutes, and three or four of them generally produce the effects of a single tub bath.

(8) *Cold sponge bath.*—The procedure is the same as that described in *a* (3) above except that the water is between 70° and 80° F.

(9) *Cold spray bath.*—(*a*) To give a patient a bath in bed, pass under him a rubber sheet the size of the bed, a bed sheet, and over this a large rubber sheet about 3 feet wider and 2½ to 3 feet longer than the mattress. Attach a small rope or cord to the head and foot of the bed, on each side, about 6 inches above the mattress, and stretch it firmly. Over this cord pass the large rubber sheet and fasten with clothes pins, thus forming a trough to carry off the water. Direct the lower end of the rubber sheet into a pail at the foot of the bed and raise the head of the bed a few inches on blocks.

(*b*) Remove the top covers and place a towel over the patient. Water, of desired temperature, may be sprinkled on with a watering pot, or from a pitcher or a siphon connecting with a pail placed above the bed. If the bath is cold, the patient should be well rubbed during its administration. After the bath is finished, drain off the water, and with a towel wipe the rubber sheet dry, withdraw it from beneath, and dry the patient with the sheet on which he will then lie.

(*c*) In the field, substitutes for a tub may also be extemporized. An ordinary camp cot may be taken, the canvas bottom punched full of holes, and a piece of rubber sheeting tacked across the frame below the canvas in such a way that it will form a gutter draining toward a pail placed at the foot. On this cot the patient is to be placed and cold water sprinkled or poured over him; or an upright frame may be made, to the sides and ends of which rubber sheeting may be attached in such a way as to form an extemporized tub. With a small piece of rubber sheeting, and a tin cup, perforated at the bottom as a sprayer, a cleansing bath may be given even on a litter or a bath board.

(10) *Alcohol bath.*—Sometimes when one of the cold type baths are not advisable, an alcohol or sponge bath may be given. As alcohol evaporates more rapidly than water, it cools the skin more readily. For this reason, good effects can be obtained with the use of a smaller amount of alcohol. Fifty percent alcohol is used. The bed is prepared by protecting the lower sheet with towels or a rubber sheet. All of the bed covering is removed except the top sheet, which is kept over the patient. As in the sponge bath, only one part of the body is bathed at a time. The alcohol should be applied briskly and with long, downward, sweeping strokes, care being exercised to

avoid the face, the genitals, and the anus. If the patient's condition is good, the alcohol may be dried by fanning; otherwise it must be wiped with a towel.

205. Care of mouth and teeth.—In the case of patients who are convalescents or not seriously ill, the teeth and mouth are cared for the same as in health, that is, the teeth are brushed two to three times a day. When patients are seriously ill, or unable to care for their mouth and teeth, this must be done by the attendants. In cases where the fever is high, there is an insufficiency of the normal oral secretions, resulting in a drying and cracking of the membranes of the mouth and gums. The teeth become covered with residue of food, mucous, dried epithelium, and bacteria. This is known as sordes and requires removal after every meal. Any of the several type mouth washes may be used. Herpes, "fever blisters", or "cold sores", are inflammation of the membrane or skin and unless properly cared for may result in ulcers. It is also well to cover the lips with cold cream, lemon juice in glycerine, or boric acid ointment to prevent drying and cracking; this to be done after the mouth and teeth are well cleansed.

206. Morning and evening toilet.—*a.* The morning toilet is the routine care given patients before their breakfast. The purpose is to clean and refresh the patient after the night and to make him comfortable and ready for his morning meal. The patient should be given the opportunity to use a bedpan or urinal if desired. The face and hands should be washed, hair combed, and teeth brushed. The bed should be made comfortable and the bedside table or bed made ready for the breakfast tray.

b. The evening toilet is the routine given to all patients before "lights out" at 9 PM. After the evening nourishment, the same procedure as described in the morning toilet should be repeated. In addition, it is well in most cases to give an alcohol rub. This relaxes the patient and promotes sleeping. Extra bed covering should be placed within easy reach, adequate ventilation afforded, bed lights checked and adjusted, and fresh drinking water provided.

207. Care of skin and back.—In the case of bed patients it is of utmost importance that skin and back be carefully watched to prevent bedsores or pressure spots. Special attention should be paid to the skin over all bony prominences. In most instances pressure sores or bedsores may be prevented by carefully examining the patient during the morning bath and giving an alcohol rub over the back with 50 percent alcohol at least twice a day. This stimulates and toughens the skin, makes it less sensitive, and lessens the chance for a destruc-

tive process to start. If evidence of pressure presents itself, it is well to afford some means of protection to the involved area by pads or rubber rings. It is also well to powder the areas well with talcum powder or starch.

208. Bedsores.—*a.* These are localized ulcers resulting as a rule from pressure and are caused by the patient's lying too long in an unchanged position. A similar condition may also be caused from excessive moisture between two skin surfaces and by interference with circulation from a too tight bandage or appliance. Bedsores result from body discharges, irritants, soiled or damp linen, lowered vitality, breaks in the skin, excessive sweating, improper care of the skin, and infrequent bathing.

b. The prevention of bedsores is the best treatment. In cases where there is evidence that a bedsore is starting, frequent bathing, alcohol rubs, and powdering over the pressure areas should be used. In some cases a water or air mattress should be used. Sometimes bedsores develop in spite of the best nursing care and in these instances the area surrounding the sore should be rubbed well with alcohol several times a day. The sore itself should be kept well cleaned and protected. Dressings or such other treatment as may be necessary will be prescribed by the ward officer.

209. Food and water.—*a.* These items are of utmost importance, and special attention is required to see that the patient receives the proper kinds and amounts. To a person who is required to stay in bed most or all of the time, there is nothing that adds to his well-being more than his food and drink when properly prepared and served. Meals are of utmost importance to the convalescent patient, as his appetite is returning.

b. Patients who are chronically ill or seriously ill sometimes become problems, as they are fastidious and notional as to what they want to eat and drink. It is imperative that an ill patient receives a sufficient quantity of nourishment and of the quality and type indicated for his condition and his ability to assimilate.

c. Patients who are helpless or seriously ill will have to be served, and it is important that they expend little or no energy in attempting to help themselves. Sometimes a patient should continue to lie flat in bed and eat, and in such an instance feeding cups or drinking tubes will have to be used.

d. The prompt serving of sufficient quantities of a tempting variety of food on an attractive tray or table means much in keeping a patient happy. The patient's desires should be catered to if reasonable and

not contraindicated by his disease, providing such catering is practicable and hospital regulations are not violated.

210. Body discharges.—The elimination of the waste products from the body is a normal physiological process. These waste products are eliminated mostly through the intestine, urinary tract, and the skin. Defecation or elimination through the intestine is of great importance in the cure of a sick patient. Establishing regular time for bowel movements will tend to prevent constipation which is so common in bedridden patients. Bedpans or urinals must, however, be furnished without delay upon a request from a bed patient.

a. Bedpans.—Patients should never be subjected to a cold bedpan; it should always be warmed. This can be done by allowing warm water to run over it and then drying it thoroughly. Then take it, a cover, and toilet paper to the patient. Put the pan on the bed near the patient. Put the hand which is nearest the head of the bed under the buttocks, raise the patient, and slip the pan into position, being sure it is well placed. If possible, have the patient flex the knees and place the feet firmly on the bed, before the pan is put under him. The covers are then placed over the patient. When the pan is ready to be removed, the bed covers are arranged so as to not interfere with the removal of the pan. Be sure that the patient is clean and if unable to use the toilet paper, do so for him. As when the pan was placed under the patient, the hand is placed under the buttocks the patient raised, and the pan removed. This should be done easily so that none of the contents are spilled. The pan is covered at once. the room or ward is then aired. Before emptying and cleaning the pan, examine its contents and anything abnormal should be reported or shown to the ward surgeon.

b. Urinals.—(1) A urinal is used to collect the waste material, where the patient is weak, ill, or otherwise bedridden.

(2) The urinal should be adjusted and properly placed so as not to spill. It should be promptly removed after being used, care being taken not to spill its contents on the bed, causing unnecessary discomfort to the patient and unnecessary work on the part of the attendant. If it is necessary to carry the urinal outside of a room to empty it, it should be covered.

(3) After removal of the urinal, its contents should be inspected and any abnormal condition reported.

c. Cleansing receptacles.—In cleaning both urinals and bedpans, after they have been emptied, they should be well rinsed with cold water, scrubbed if necessary, and then washed in hot water. At least once a day both bedpans and urinals should be boiled or steri-

lized with steam. In cases where the waste products are infectious this should be done each time they are used and urinal and bedpan kept isolated and used only for the same patient.

d. Sweating.—The elimination of waste products thru the skin is known as sweating or perspiring, and is taken care of by proper bathing.

211. Rest, sleep, and exercise.—These measures are necessary to some degree for all patients, as they promote convalescence and the general well-being.

a. Rest comprises both physical and mental relaxation and is accomplished by the support of the body by a bed or chair without any effort expended on behalf of the patient. To obtain such a relaxed state, the bed or chair must be comfortable and the pillows and bed coverings arranged so as to suit the patient. In the case of bed patients it may be necessary to support the body or limbs by means of pillows, sandbags, etc., so as to attain the desired position and to avoid effort on the part of the patient. An attempt should be made to remove any cause for worry or restlessness.

b. Sleep is that condition where the entire body and all of the organs relax and repair processes proceed. It is most beneficial when unbroken. Care must be taken to avoid disturbing and awakening patients. Noises from any cause should be eliminated as much as possible.

c. Exercise plays an important role in the treatment of patients, especially in those who are convalescing. Even in patients who are confined to bed, exercise is desirable and possible in many cases, especially if there is no contraindication from the standpoint of treatment. Exercise tends to tone up the circulation, promote elimination, and help maintain the patient's strength.

212. Administering medicines.—*a. General.*—This procedure is one of the most important parts of proper nursing and is accompanied by a certain element of danger. The person giving medicines must be trustworthy and realize his responsibility. In order to avert mistakes, always have an order book in the ward. Follow orders for the administration of medicines as prescribed by the ward officer in the order book. There are several points of importance which must be borne in mind concerning the care, measuring, and administration of medicines.

(1) Keep the medicine cabinets locked and do not leave the key where patients can get it.

(2) Never keep medicines in unmarked bottles and do not use a dose of medicine that has been left in an unmarked glass.

(3) The person in charge of the medicine cabinet should examine its contents daily and make sure that there is an adequate amount of all necessary drugs on hand. Medicines should not be ordered in large quantities for many kinds deteriorate with age. Drugs that have undergone any change in color, odor, or consistency should not be used without first consulting the ward officer.

(4) Keep oils in a cool place. Also many of the antitoxine, vaccines, and drugs derived from animal glands need to be kept cold.

(5) Give medicines on time.

(6) While measuring medicines, never think of anything but the work on hand and never speak to anyone or allow anyone to speak to you.

(7) Measure exactly; never give a patient a drop more or less than the amount ordered.

(8) While pouring a medicine, hold the glass with the mark of the quantity you require on a level with your eye; if the mark is above your eye, you will give too little, if below, too much.

(9) Read the label on the bottle three times before taking it from the shelf, and before and after pouring out the medicine.

(10) Shake the bottle before pouring out medicines that are not perfectly clear or that contain a sediment unless the label prescribes otherwise.

(11) To avoid defacing the label while pouring a medicine, hold the bottle so that the label will be on the upper side, but do not let your hand come in contact with it, and before replacing the bottle on the shelf, wipe the rim of the bottle with a piece of gauze kept for that purpose.

(12) Recork or recap a bottle immediately after pouring out the drug, for many medicines contain volatile substances and will thus become either stronger or weaker if left uncorked.

(13) Never mix or give at the same time different medicines.

(14) Do not dilute syrup cough medicines, because dilution will minimize the soothing effect of the syrup on the mucous membrane.

(15) Make doses of medicine as palatable as possible. Therefore, have the water used for dilution either very hot or very cold.

(16) Give acids and medicines containing iron through a tube, because acids may corrode the teeth and iron discolors them.

(17) Never give food, drink, or medicine by mouth to an unconscious patient. Medicine should not be administered to delirious patients except in presence of a medical officer who may judge whether the medicine has been properly swallowed.

(18) Never allow one patient to carry medicine to another.

(19) Do not leave a patient until the medicine is swallowed.

(20) Never record a medicine as given until the patient has taken it.

b. Orally.—Administration of medicines by mouth or orally is the most common of all methods used and in measuring the medicine to be given, if liquid, the following procedure should be strictly followed:

(1) Take a medicine glass in the left hand and, after reading the label (*a* (9) above), the bottle of medicine in the right.

(2) Shake the bottle if necessary.

(3) Read the label.

(4) Take the cork between the third and fourth fingers of the left hand and extract it. Hold it thus while you are pouring out the drug.

(5) Raise the glass until the mark representing the amount of drug that is to be given is on a level with your eyes.

(6) Pour in the drug until it is on a line with this mark.

(7) If more than one patient is getting the same medicine, pour out the number of doses required; if not, put the cork in or cap on the bottle, wipe the rim of the latter with a gauze compress, read the label on the bottle, and return it to the shelf.

c. By inhalation.—This may be either by dry or by moist inhalations.

(1) Dry inhalations are of the gaseous type, such as oxygen. There are several methods, the simplest being to run oxygen through water. The amount and rate of flow is controlled by a valve which is attached to the oxygen tank. Other dry or gaseous inhalations are ether and chloroform.

(2) Moist inhalations are given in the form of steam in cases where it is desired to relieve spasmodic contractions of the bronchial muscles, to increase expectoration, and to sooth inflamed membranes. Usually some type of drug is placed in the water which is carried by the steam into the air passages. There are several types of steam inhalators but the simplest is a vessel containing boiling water covered with a heavy paper cover or bag with a small opening at the top which allows the vapors to escape near the patient's mouth and nose.

d. Hypodermically.—(1) Hypodermic medication is the giving of drugs into the subcutaneous tissues of the body. Drugs are given in this manner when—

(*a*) Quick action is desired.

(*b*) The drug cannot be retained because of vomiting.

(*c*) The patient is unconscious or cannot swallow.

(*d*) The drug will be affected undesirably by gastric or intestinal secretions.

(*e*) The drug is not readily absorbed from the alimentary tract.

(*f*) The effects are desired at the area of injection, as in the case of a local anesthetic.

(2) For giving medication in this manner, the hypodermic syringe and needle are used. The solution used should be freshly prepared; the needles must be clean, sharp, and aseptic; the syringe freshly sterilized; the skin where the injection is made must be cleansed.

(3) To render the needle aseptic boil it in a spoonful of water. Disinfect the syringe by boiling or by immersion in 70 percent alcohol. Never attempt to use a needle the point of which is dulled or bent. In making the injection care must be taken to avoid blood vessels, nerves, and bones; for this reason a fleshy part should always be selected and the injection made obliquely; the outside or lateral surface of the arm or the front or anterior surface of the thigh is usually chosen.

(4) Draw the medicine into the syringe, put the needle on the syringe with sterile forceps, hold the syringe vertically, needle up, and gradually press the piston until all air has been forced out as indicated by the escape of a drop of fluid, wash the skin at the point of injection with a little 70 percent alcohol, paint with tincture of iodine, draw the skin tight, and thrust in the needle quickly. When the needle has penetrated about half an inch, force out the liquid slowly, withdraw the needle, and press a clean gauze sponge for a moment on the puncture. Before putting the syringe away cleanse and dry it thoroughly; remove the needle, force out the last drop of fluid, and at once insert the wire into the needle.

e. Intramuscularly.—Intramuscular injection is one in which the drug is injected into the muscle. Absorption takes place quicker when given by this method than hypodermically and is also used where the drug is irritating to the tissues immediately below the skin or when a large amount is to be given. The muscles of the deltoid, lumbar, or gluteal regions are usually used. The equipment necessary is the same as in the case of a subcutaneous injection. The skin over the area where the injection is to be made is well cleansed and tincture of iodine applied. This is cleaned off with alcohol before the injection is made. The needle is inserted almost at right angles quickly and steadily into the muscle. If large amounts of the drug are to be given, it is well to cover the point of insertion with collodion to prevent leaking after the needle has been withdrawn.

f. By venoclysis.—(1) Intravenous medication or injection is so called because the solution of the drug is introduced directly into the vein. Usually a vein near the bend of the elbow is used. This type of procedure must be given by or under the supervision of a medical officer with the help of trained assistants. As a rule when intravenous medication is to be given, no food will be given until after completion of the procedure.

(2) At times the veins are not available and it is then necessary to cut through the skin and dissect out a vein for use. This becomes a surgical procedure and must be done by the medical officer.

g. By hypodermoclysis.—Hypodermoclysis is the giving of large amounts of fluids into the subcutaneous tissues. It is used to replace fluid loss from the body and is given to patients who are unable to take fluids by mouth. The loose tissue under the breasts, or the abdomen are the usual sites for injection. The site for injection should be prepared with care and precaution. The fluid to be given must be sterile. Usually about 500 cc. to 1,000 cc. is given at one time. Rapid flow of the fluid into the tissues must be prevented by controlling the rate of flow. The part receiving the fluid should be massaged.

h. By proctoclysis.—Murphy drip or proctoclysis is the instillation of fluid by a slow drip method by way of the rectum for absorption through the intestinal wall. Lost fluids may be replenished by this procedure and it is also used where fluids cannot be retained by mouth, in surgical shock, profuse perspiration, etc. A special apparatus is used so that the rate of flow may be regulated by means of a clamp (on tubing) or by elevating or lowering the container of fluid. The fluid to be given should be about 110° F. and this temperature is maintained by attaching hot-water bottles around the container. The top of the container should be well covered with a sterile towel and the tubing frequently checked for leaks. The tubing should be of ample length to prevent its slipping out of the rectum. The amount of fluid given should be noted and rate of flow can be calculated by observing from time to time the amount remaining in the container.

i. By enemata—This involves the injection of fluid into the lower intestinal tract or bowel by way of the rectum for therapeutic or nutrient purposes and is usually called an evacuant or retention enema.

(1) *Evacuant enema.*—An evacuant enema is given so as to cleanse the lower bowel because of constipation, to relieve distention by gas, and to increase or decrease the body temperature.

(*a*) The following routine equipment is required for giving an evacuant enema: a bath blanket or sheet; an extra rubber sheet and covering; irrigator stand; irrigating can, fully equipped with tubing, connecting tubes, tip and rectal tube, and stopcock or regulator, all connected ready for use; pitcher of solution, properly prepared and of required temperature; bedpan and cover, lubricant and wooden tongue depressor; kidney basin; bath thermometer; gauze compresses; mixing spoon; basin with warm water for cleansing patient following enema; towel; bed screen. The following points should be remembered: Have all necessary articles assembled at the bedside; have patient properly screened; never expose patient; have mattress well protected with extra rubber sheet and a sheet.

(*b*) The simple soapsuds enema is probably the one most frequently given, but is irritating to the bowel wall and ordinarily less desirable than a simple enema of 1 to 2 quarts of plain warm water or water with 1 teaspoonful of sodium bicarbonate added to each pint. For a patient who can go to the toilet, 1 pint is often sufficient. For soapsuds there should be kept on hand a jar of liquid soap, prepared by boiling or dissolving some pure soap in sufficient water to form a soft jelly. To prepare the enema dissolve 2 or 3 ounces of this jelly in a pitcher of water at temperature of 108° F., mix well, and remove froth. If pieces of soap are used, after water becomes sufficiently soapy remove pieces to prevent clogging of the tubing. Carry solution, covered, to the bedside, where proper assembly of articles and preparation of bed and patient have been previously made.

(*c*) When giving an enema replace the upper bedclothes with a blanket or sheet; draw the patient to the right side of the bed, turn him on his left side, drawing up and flexing somewhat the right leg, and drawing the left leg down and back somewhat; have the correct amount of solution at proper temperature; lubricate the tube well to make insertion easy, and to prevent injury; expel all air from the tube by allowing the solution to flow through until of the right temperature; pinch the tube and insert it in the rectum. Use no force when introducing the tube or tip. If the sphincter muscles are tense, encourage and assist the patient to relax by reassuring him and explaining the necessity of so doing; remove pressure on the tube and allow the solution to enter slowly; if the patient complains of pain, and gas is heard rolling, shut the clamp on the tube for a moment and move it slightly back and forth, at all times urging patient to relax and prevent premature expulsion of the enema. Frequently where gas has accumulated behind the feces some will

escape about the tube or, forcing back the fluid in the tube, escape through it in bubbles in the top of the can; following this relief from escape of gas, more fluid may be injected until a pint or more has been given. Urge the patient to retain this for 5 minutes, or as long as he can without distress, when it should be freely and voluntarily expelled. Occasionally a patient, because of weakness, constriction of muscles, or from temporary paralysis of peristalsis, is unable to expel the enema. When this occurs hot stupes are sometimes used to stimulate muscles and relax rigidity, and if these are not effective the fluid is siphoned off by inserting the rectal tube and draining the fluid into the bedpan. When this is necessary the object of the enema has been accomplished only partially, for peristalsis has not been stimulated and the abdominal muscles have not been relaxed as they should have been. The resulting relief is much less; in fact, this is sometimes a dangerous symptom as, when following an operation, it may indicate peritonitis; or in typhoid it may indicate a perforation of the intestine. Sometimes when too small a quantity has been taken or when the system, needing fluids, has absorbed much of the enema, a second enema will have to be given. When this is necessary use the routine procedure, but watch carefully for any untoward symptoms. Stop immediately and siphon off fluid if excessive discomfort, distention, or other unpleasant symptoms occur.

(*d*) When the enema has been expelled remove the bedpan, cover it, and take it from the ward immediately. Thoroughly cleanse the patient, remove the extra rubber and draw the sheets, replace pajamas, straighten and tidy the draw sheet, and replace the bath blanket or sheet with the bed covers, leaving the patient comfortable and clean. Remove all utensils and return them to their accustomed places in readiness for the next time needed. Air the room thoroughly, and make a complete and correct record of results of the enema. The rectal tube or tip should never be placed in the enema can, but removed from tubing and placed in a receptacle for that purpose.

(2) *Retention enemata.*—Retention enemata are given where it is desired to—

(*a*) Supply the patient with fluid or food because he is unable to retain anything by mouth, is unconscious, dehydrated, or unable to swallow.

(*b*) Administer medicines.

(*c*) Administer anesthetics.

(*d*) Apply local application to the rectum and lower bowel. The amount of fluid given in retention enemata varies, 6 to 8 ounces being the usual maximum amount when given within a short period, but may be considerably more if given drop by drop over an extended period of time. The temperature of the fluid should ordinarily be 100° F. Retention enemata should be given strictly according to specific directions as to quantity, rate of speed, and length of time to be retained. Before giving ascertain that the lower bowel has been emptied sufficiently long to allow peristalis to have subsided. For small amount of fluids a rubber catheter with funnel attachment may be used. Following the introduction of the fluid a hot compress applied with pressure to the anus for a few minutes will often assist greatly in preventing expulsion of the enema. Remove the catheter slowly, pinching the tube or applying the shut-off before and during the removal of the tube.

(3) *Nutritive enemata.*—Nutritive enemata consist of specially prepared foods in liquid form. They are prepared according to various formulae, depending upon the conditions for which given; and the preference of the medical officer prescribing.

(4) *Sedative enemata.*—Sedative enemata usually contain some drug or special preparation for quieting or soothing and are given according to specific directions. The patient should be made as comfortable as possible before the sedative enema is given so that he may be ready for sleep following it.

(5) *Astringent enemata.*—Astringent enemata consist of hot water (120° F.) or of some astringent preparation for drying up or lessening intestinal secretions or for stopping hemorrhage. They are given under definite instructions from the medical officer.

(6) *Carminative enemata.*—Carminative enemata are occasionally used. These are of many types but two are of sufficient importance to be mentioned here. These are the turpentine enema and the milk and molasses enema. These cause an increased expulsion of flatus.

(*a*) Turpentine enemata are made by mixing 1 dram (1 teaspoonful) of turpentine with 1 ounce of cottonseed or mineral oil. This mixture is then added to 1 pint of soap suds and is stirred constantly while it is being given.

(*b*) Milk and molasses enemata are made of equal parts of milk and molasses (usually 7 ounces of each). This mixture should be retained by the patient as long as possible and then followed by a simple cleansing enema.

213. Counterirritants and other external applications.—As the name implies, counterirritants are applied for the purpose of

producing irritation over an affected area, which promotes relief from inflammation, from congestion, and from pain. This is accomplished by dilating the superficial blood vessels and at the same time by reflex action causing a contraction of the deeper ones, thus drawing the blood away from the affected part. Counterirritants are classified as rubefacients, those causing only redness of the skin; vesicants, those producing blisters; and the caustics, which cause a burn or slough.

a. Rubefacients usually employed are mustard, liniments, heat (both dry and moist), stupes, and cupping. Special care must be exercised in applying any of these to prevent blistering.

(1) Hot-water bottles and electric heating pads are forms of dry heat.

(*a*) In the case of the hot-water bottle, the water must be hot but not scalding; fill the bottle only about half full and force the air out of the bag before the cap is screwed on; the bottle should then be covered with a towel or cover provided for this purpose, so as not to burn the patient. The skin of the patient should be watched from time to time.

(*b*) Electric heating pads require special precautions. All wires should be well insulated, so as to prevent a short which might result in burning the patient or bedclothes. It must also be remembered that unless the pad is especially made, it can never be used with a wet dressing. A short circuit may result, which may cause severe burns. If an electric pad is to be used for any length of time, it should be checked frequently, as it may burn the patient.

(2) Hot wet dressings are applied by wringing out gauze compresses or towels in a hot solution. They are then applied to the part and covered with oiled silk or rubber sheeting so as to protect the bedclothes and mattress. A hot-water bottle should then be applied over the rubber sheeting or oiled silk so as to maintain the heat. The dressing should be kept wet and hot at all times.

(3) Mustard plasters are prepared by mixing a paste of flour and mustard (about 1 part of mustard to each 5 to 8 parts of flour) and adding water so as to make up a smooth paste, which is spread evenly on a piece of thick muslin. The edges of the muslin are turned in and the surface which is to be next to the skin is covered with a piece of gauze. The application should be watched carefully and should not remain on the patient over 15 to 20 minutes. After the mustard plaster is removed the skin should be dried and kept covered. If the skin is very red, a bland ointment may be applied. If

mustard leaves are used, they need only to be dipped in tepid water, allowed to drip onto a piece of muslin or directly on the skin, and allowed to remain on the patient for 5 to 10 minutes. Blistering is more likely and the skin must be watched closely. After removal, the skin must be carefully dried and covered.

(4) Poultices are made of various substances in the form of a soft, hot paste which holds heat and moisture. Flaxseed meal is generally used as it retains heat and moisture for a considerable period of time. To make a flaxseed poultice, add flaxseed to about 2 cups of boiling water until a paste consistency is obtained, stirring constantly while the flaxseed is being added so as to have the paste smooth and to prevent sticking. Apply the paste to a piece of muslin, spreading it to within 2 inches of the edges; turn the edges back over the paste and cover with another piece of muslin. Before applying the poultice, the patient's skin should be prepared by oiling well. Make sure the poultice is of the desired temperature and apply. Cover the poultice with a binder. The poultice should be renewed every 30 to 45 minutes, never using a previously used poultice. When flaxseed is not available, oatmeal or cornmeal may be used.

(5) Stupes or hot fomentations consist of a couple of layers of flannel wrung out of hot water and applied to the skin, which has been oiled to prevent blistering. The flannel is then covered with oiled silk or rubber sheeting. The flannel is wrung out by placing in a piece of canvas or a towel, so as to prevent burning the hands. Stupes are changed about every 30 minutes to 1 hour. If a turpentine stupe is desired, it is desirable to mix the turpentine with olive oil, mineral oil, or cottonseed oil in a proportion of 1 part of turpentine to 2 parts of oil. The mixture is heated and stirred so the two substances are well mixed. Apply the mixture to the skin with the fingers and then apply the heated flannels as already described.

(6) Iodine may be used as a counterirritant by "painting" the area with a swab or camel's-hair brush. This is allowed to dry. Before applying the tincture of iodine make sure that the patient is not sensitive to iodine, and that *it is never applied on a surface where bichloride of mercury, mercurial ointments, or mercurial preparations have been recently used.* Never cover the "painted" area, as blistering will result.

(7) Cupping is the application of glass cups to the skin. A vacuum is created in the cup when applied and is usually created by suction, although heat will also do it by heating the rim of the cup and applying to the skin, making sure that the edges are not too hot.

By cupping an actual extravasation of blood beneath the skin takes place. Never try to apply a cup over an irregular surface. To remove a cup, hold it in one hand and with the index finger of the other hand press the skin just beneath the edge of the cup so as to admit the air, when the cup will drop off.

b. Vesicants are used when a more marked effect is desired and are used to cause absorption or removal of inflammatory waste. The most common vesicant is cantharides in the form of a plaster or collodion. Before applying, the skin must be asceptically prepared. A thin coating of cantharidal collodion or plaster of the desired size should be applied. After the blister has formed, usually in 4 to 8 hours, the plaster is removed, taking care not to break the blister. If cantharidal collodion is used, it is removed with a sterile gauze sponge wet with ether. The blister is then covered with a dry sterile dressing and is opened only when ordered by the medical officer.

c. Caustics are used when prolonged action is desired.

(1) They are used when it is desired—

(*a*) To stimulate healing.

(*b*) To produce death and sloughing of the tissues.

(*c*) To remove warts, etc.

(2) Potassium hydroxide, copper sulfate, nitric acid, sulfuric acid, oxalic acid, arsenic, and the actual cautery are the ones usually used.

(3) A caustic must be used only by or under the supervision of a medical officer, and great care must be exercised. When the desired action is obtained, the caustic is usually neutralized so as to stop its action.

d. Cold is used to relieve pain and to reduce inflammation, and is usually used in the form of ice, ice water, ice caps, cold coil compresses, local baths, or irrigations.

(1) In using ice caps, the ice must be broken into small pieces. After filling the ice cap about half full, the air should be expressed and the cap screwed on securely. The bag should be covered with a towel or a cover provided for such purpose. To crush the ice, a mallet and canvas bag can be used if a mechanical devise is not available.

(2) Cold compresses consist of several layers of gauze or cotton which have been dipped into ice water, well wrung out, and then applied to the desired part. They must be changed frequently so as to maintain the cold temperature desired. Provided compresses are to be used over the same part, they may be used over and over.

Section III

SURGICAL PROCEDURE

214. General.—Surgical procedure in nursing and ward management deals with the performance of methods essential to the proper preoperative and postoperative care of patients undergoing surgical operation. It also deals with the performance of certain procedures which are in general use in the care of patients receiving surgical treatment.

215. Preoperative preparation.—An individual undergoing a surgical operation needs preparation both mentally and physically.

a. Patients in a proper state of mental condition withstand surgical procedures better than those who are not in a proper mental condition. Thus, it is necessary for all individuals engaged in the care of patients prior to operation to extend every effort to properly prepare the patient mentally for the procedure which he is to undergo. Ward attendants may be of great help in maintaining a cheerful attitude, in being considerate of the patient's desires, and explaining to him that he will receive the best possible care both before, during, and after the operation. In addition to these general reasons for mental preparation, there is a special reason—namely, that of anesthesia. All of the anesthetic agents produce their desired effect best and less of them is required, as a rule, if the patient takes them calmly and in the spirit of cooperation with their purpose. This is particularly true in the case of those anesthetic agents which are given by inhalation methods. Spinal anesthesia is also easier of performance and better in the production of anesthesia if the patient is calm and mentally desirous of having the procedure performed. An anesthesia which is not smooth and unobstructive

is a handicap to everybody engaged in the operative procedures. The proper mental preparation of a patient undergoing surgery is one of the most important tasks of surgical nursing and ward management.

b. The physical preparation of a patient for operation demands exactness in the performance of required preoperative procedures. The site of operation is thoroughly cleansed with soap and water, carefully shaved, and the skin cleansed with ether. The area prepared should extend well beyond the specified point of incision to prevent danger of contamination from skin surfaces during the operation. Certain features of the preoperative preparation will vary depending upon the type of operation to be performed and upon the anesthetic to be used. In general, patients undergoing operation will be given a soapsuds enema the night prior to operation. If an anesthetic agent is to be used which is administered by rectum, it is important to cleanse thoroughly the lower bowel by repeated enemata, usually using only tap water, until the return flow from the enema is clear. Following the enema the patient usually retires and is given a sedative in order to promote relaxation and assure a restful sleep. On the day prior to operation a complete urinalysis and blood count should be performed. On the morning prior to operation a soapsuds enema is given 2 hours before operation and often another sedative is given. A hypodermic injection of morphine usually combined with atropine or scapolomine is given 1 hour prior to operation. The diet of a patient scheduled for operation should consist of a light supper and no food or liquids after midnight prior to the day of operation. In certain instances these procedures will be altered. The preoperative orders as written by the medical officer should be carefully followed. Before a patient is taken to the operating room any money or jewelry he may have should be removed and turned over to the proper authority for safekeeping. Artificial teeth should be removed and placed in boric acid solution in a labeled receptacle. Patient should be encouraged to urinate before going to the operating room and the time and quantity of urine voided should be recorded.

216. Postoperative care.—The postoperative care of a patient begins with the completion of the operation. Thus, the operating room personnel has a very important part in the immediate care of the patient following operation. The patient is transferred from the operating table to the ward for further postoperative treatment. The transferring of a patient from the operating table to a stretcher, or from the stretcher to a bed, must be performed with care. Three

or more attendants are necessary to transfer the patient properly. The tallest and strongest attendant should stand in the center, having one arm under the hip and the other under the thigh of the patient. One attendant should place his arms under the patient's shoulder, one elbow supporting the head and the other extending well down on the back. The third attendant keeps the lower legs from dangling or striking the foot of the bed. At a given signal all three should take firm hold of the patient's body and lift, turn, and place him gently on the bed or stretcher. During the transfer the patient should be well covered. The bed on which a recently operated patient is placed is known as an "anesthetic bed" and is prepared as described in paragraph 218. On return to the ward the patient is placed in the bed in the position prescribed by the medical officer. This position will vary depending upon the type of operation performed and the patient's condition following operation.

217. Recovery room.—*a.* A designated room or ward in which attendants are especially trained in the postoperative care of patients provide the best manner of postoperative supervision. Such a room or ward is designated as a "recovery room" or "recovery ward." Visitors are not allowed unless the patient is seriously ill. The room must be quiet and properly ventilated but without draft. The attendants must be constantly alert to detect any unusual signs or symptoms during this postoperative period. After the patient has returned to the recovery room he should not be left alone until he fully regains consciousness. The pulse and respiration should be recorded every 15 minutes during the first 2 hours and longer if necessary. Blood pressure readings will, in certain instances, be required at 15- to 30-minute intervals.

b. If a general anesthesia has been used the patient's jaw should be held upward and forward until consciousness has been regained to prevent the tongue from falling back into the throat. If such procedure is not followed respiratory difficulty may be encountered due to the tongue's obstructing the air passages. The head should be turned slightly to one side to make it easier to care for the vomitus and remove mucous from the mouth and throat. When vomiting occurs raise the head slightly, tipping it forward and to the side with a basin placed beneath the angle of the jaw and supporting the patient's head with one arm and hand. With the other hand wipe the patient's mouth and face and remove the mucous from his mouth. Frequently dry the patient and replace the damp clothing and linen as soon as it is wise to disturb the patient, taking care to avoid exposure of any part of the body surface. If spinal anesthesia has

been used the patient is usually conscious on return to the recovery room. It must be remembered that he is usually unable to move the lower portion of his body. Nothing is given by mouth until ordered by the proper medical officer.

c. Special complications to watch for and report promptly include hemorrhage, collapse, difficulty in breathing, blueness of skin (cyanosis), and undue excitability of the patient.

(1) Occasionally morphine excites rather than quiets the patient.

(2) Hemorrhage is denoted by the presence of bloody drainage on the patient's dressings, by a weak, rapid, and irregular pulse, by pallor, excessive restlessness, and an anxious expression. The patient often gasps for air, a condition called air hunger, and frequently complains of being unusually thirsty. Blood may also be present in the vomitus, stools, or in the urine.

(3) Collapse or shock is indicated by a weak and rapid pulse, marked general weakness, and a cold, clammy skin.

(4) Cyanosis is noted as a blue or blue-tinged color to the patient's lips, fingers, or face.

(5) The prevention of certain complications, chiefly those related to the pulmonary system, is of particular importance in the early postoperative care. All patients, if their condition permits, should be turned from side to side and encouraged to cough and expectorate any sputum or mucous which collects in the throat. Deep breathing should be encouraged and 10 deep breaths should be taken every 15 to 20 minutes. The only way to assure the proper performance of these details is by the close attention of the attendants.

d. Every recovery room should have readily available a mouth gag, fluid for intravenous medication, oxygen, and carbon dioxide. Patients operated upon under spinal anesthesia are placed in a bed which has been elevated at least 6 to 12 inches. The blocks used for elevating the bed are not removed until ordered by the medical officer. The diet of patients during the postoperative period will be prescribed by the medical officer. Usually liquids such as warm water or tea are permitted as soon as the patient has reacted from this anesthesia and nausea or vomiting have subsided. Often a proctoclysis will be prescribed immediately on the patient's return to the recovery room. Patients usually remain in the recovery room 48 to 72 hours.

218. Anesthetic bed.—An anesthetic bed, formerly called ether bed, is prepared especially for patients who are or who have recently been anesthetized. The object of an anesthetic bed is to provide accessibility, safety, warmth, and comfort for the patient. In pre-

paring such a bed, the following equipment is required in addition to that usually required for bed making—namely, three blankets, one pajama coat, one hand towel, one paper bag and a safetypin, four hot-water bottles with covers, and two shock blocks. On the bedside table should be placed a swab can, a two-sponge basin, a quantity of gauze wipes, paper, pencils, and a watch with a second hand. Make the bottom of the bed in the usual manner of preparing the bed for any bed patient. Place across the middle portion of the bed a rubber sheet which is covered by a folded white sheet, this being known as a draw sheet. The top of the bed is prepared as follows. A blanket is placed on top of the draw sheet. This blanket is in turn covered with an ordinary sheet. Additional blankets may be added as needed, usually two being used, the final blanket being covered with a sheet. Hot-water bottles, three or four, distributed over the surface of the bed between its top and bottom portions. On arrival of the patient the top covers are folded along the opposite side of the bed, the hot-water bottles are removed, and the folded blankets are placed over the patient. The hot-water bottles are then placed between the blankets. In warm weather fewer blankets are needed.

219. Shock blocks.—Shock blocks are solid cubes of wood about 6 inches square, varying from 4 to 18 inches in height. In the center of the top a hole is bored large enough to receive the end of the bed leg and deep enough to hold the leg without danger of slipping. The purpose of the block is to elevate the head or the foot of the bed, as desired. When using bed blocks care should be taken not to jar or jolt the patient while raising or lowering the bed. Both blocks are of the same height in order to maintain uniform elevation. If the bed is elevated at the patient's feet, the head of the bed must be protected to prevent the patient's head slipping against the bed bars by securing a stiff pillow on the inner side of the bars, and when permissible, elevating the knees of the patient by raising the knee support of the bed.

220. Administration of fluid.—The administration of fluid by rectum (proctoclysis), subcutaneously (hypodermoclysis), intramuscularly, and by injection into the blood stream (venoclysis), has been described in section II. However, the administration of fluids is of such importance in many individuals undergoing surgical treatment that it will be described in somewhat more detail in this section. Fluids are given to replace fluids lost during or following operation and to provide an adequate fluid balance during the early postoperative days. In general, patients who have recently been operated

upon should have an intake of 2,000 to 3,000 cc. of fluid during each 24-hour period. At least 1,000 cc. of fluid is lost in the urine if the proper fluid balance is maintained.

a. The simplest form of administering fluids is into the rectum. This is known as proctoclysis, and is commonly called "Murphy drip." The fluid given is usually normal saline solution to which has been added 5 percent of glucose. The fluid is usually permitted to drop at the rate of 30 drops per minute from the proctoclysis container into a tube which is connected with a catheter inserted into the rectum. Fluid is absorbed slowly by rectum. However, approximately 500 to 1,000 cc. of fluid may be given daily by this method. It is customary to permit the flow or drip to continue for 2 hours and then discontinue for 1 hour. Careful attention must be given to the position of the catheter to avoid its being expelled and the fluid's running onto the bed.

b. The next simplest form of administering fluid is what is known as the subcutaneous method or hypodermoclysis. Fluid, usually normal saline solution, is given by injecting the fluid beneath the skin into the subcutaneous tissues. Sterile precautions are necessary. The fluid is administered by inserting a needle, usually a 19-gage needle, into the subcutaneous tissues of the breast, the thigh, or buttocks. The fluid is permitted to flow from a container by gravity to the tissues. The container is usually placed about 20 inches above the level of the patient. Ordinarily 500 cc. is given into the tissues of the breast on either side or in the thigh.

c. Intramuscular injection of fluid is carried out in the same manner as subcutaneous, except the needle is put into the muscular tissues.

d. The administration of fluid through the blood stream is known as venoclysis. The equipment necessary for intravenous infusion in addition to the specially prepared sterile infusion apparatus includes a stand for elevating the gravity tube, a tourniquet, skin sterilizing and draping supplies, sponges, and dressings. For the administration of the infusion the gravity tube is hung on the elevating stand at a height of about 20 inches above the patient and filled with the solution; the patient's arm is sterilized and draped sterilely; the tourniquet is applied; the needle is inserted into the vein and as the blood flows backward through it the tourniquet is removed; the solution is allowed to flow through the delivery tube to free it of air; with blood flowing thus from the needle and solution from the tube the two are connected and the solution allowed to flow slowly into the vein. The fluid should be warmed and maintained at a temperature of approximately 100° F. The rate of administration should permit approxi-

mately 500 cc. of fluid to flow into the vein in 30 minutes. The infusion should be discontinued if the patient complains of any unusual symptoms such as a chill or dizziness. A patient receiving venoclysis should be constantly watched.

221. Surgical dressings.—*a.* Surgical dressings prevent contamination of the area surrounding a wound and absorb secretions from the wound. Sterile gauze and cotton are the materials used in the preparation of surgical dressings. The edges of the gauze are folded so that no ravelings are free to get into the wound. Absorbent cotton made into pads of various sizes and covered with gauze is used for covering the dressings of discharging wounds. Hot wet dressings consist of gauze moistened with a solution and covered with some protective material, such as oil silk, to aid the dressing to retain its heat and moisture. The proper dressing of surgical wounds requires a knowledge of certain facts relative to the nature of the healing of wounds and the conditions which interfere with such healing. (See chapter 3 on minor surgery.) All the necessary equipment for a surgical dressing should be readily available on a dressing tray or dressing carriage. Ample light is essential and the patient should be in proper position for his comfort and convenience for the dressing of the wound. Always dress aseptic or clean wounds before beginning the dressing of septic or suppurative wounds. The maintenance of absolute aseptic technique in the dressing of all wounds is necessary. Avoidance of unnecessary conversation while performing the dressing is essential. When removing adhesive strips, pull them quickly toward the wound to prevent pulling or spreading of the incision or wound.

b. On opening a sterile dressing container do so quickly and without contaminating the contents. In removing a cover from a jar or a stopper from a bottle, the contents of which are sterile, be careful not to contaminate the inner surface of the container. Remove the sterile contents of the container with a sterile instrument and replace the cover immediately. When pouring a disinfectant solution from a bottle onto a surgical dressing, pour a small quantity of the liquid into a basin before pouring any onto the wound or dressing. When lifting or holding a sterile basin containing a solution, place the hand well under the basin and hold it steadily.

c. The equipment of a dressing tray or carriage varies according to the nature of the dressings, the responsible medical officer, and the general routine of the hospital. Certain facts are applicable in all conditions. Each article on the tray or carriage should be kept in its own particular place in order to avoid delay in finding

such articles. The tray or carriage is covered with a sterile cloth, usually a sheet, on which the sterile articles are placed and is again covered by a sterile cloth which is turned back in a manner which prevents contamination of the inner surface of the cover. The instruments needed for a dressing carriage include hemostats, groove directors, scissors, syringes, and needles. Materials for a dressing include gauze, pads and sponges, applicators, safetypins, and gloves. All of these articles should be sterile. The dressing carriage should contain a shelf for unsterile articles on which should be neatly arranged such articles as bandage scissors, oil silk or paper, binders, safetypins, rubber operating pads or rubber sheets, and attached to this carriage there should be a bucket for discarded or contaminated dressings. The essential drugs include iodine, alcohol, sterile vaseline, and certain special preparations as required by the medical officer. A simple surgical dressing is performed by first arranging the bed linen and pajamas of the patient so as to expose the wound. The adhesive tape along with the outer dressing is removed and discarded. Using aseptic technique the remaining dressings are removed, the incision cleansed with an alcohol sponge, care being taken to cleanse away from the wound, never toward it. Never go over the same area twice with the same sponge. Dress the wound as directed, applying sterile dressing.

222. Catheterization.—Catheterization is the withdrawal of urine from the bladder by the introduction of a sterile rubber or metal tube along the urethra into the bladder. Its purpose is to relieve the patient's discomfort, to obtain a specimen of urine under sterile precautions, or to drain a paralyzed bladder.

a. Ordinary.—(1) All articles used in this procedure must be sterile. Those needed include saturated boric acid solution, sterile lubricant (oil or jelly), catheters (sizes 16 to 18 French), 2 towels, sterile gloves, and a hemostat. The foreskin is retracted and the penis thoroughly washed with soap and water. The operator thoroughly cleanses his own hands and puts on sterile gloves. A sterile catheter is lubricated and with one hand holding the penis the catheter is introduced into the urethra without force until it enters the bladder from which urine flows through the catheter. The urine is collected in a urinal or sterile container and the quantity removed together with the time of its removal is recorded on the patient's treatment record. If the bladder is greatly distended, not more than 600 cc. should be removed at one time. Withdrawal of the catheter completes the procedure of catheterization.

(2) Recently operated patients should not ordinarily be catheterized less than 18 hours after operation. Methods should be tried to cause voluntary urination before resorting to catheterization. These include applying a hot-water bottle to the bladder area, allowing water to run from a nearby faucet, and fluids by mouth, if permitted. Allowing the patient to sit in bed, stand on the floor, or placing the patient in a hot bath often produces voluntary urination, but are resorted to only at the direction of the medical officer.

b. Retention.—Catheterization as described in *a* above is performed and the catheter anchored to the penis by adhesive tape. The end of the catheter outside of the penis may be closed by a rubber band or metal clamp and opened every few hours for drainage of urine, or the end of the catheter may be left open and connected to a large bottle at the side of the bed or to a urinal if the patient is up and about. The catheter should be irrigated with a mild antiseptic solution such as a 10 percent aqueous solution of argyrol once daily. The catheter should be changed once each week and permanently removed as soon as the condition of the patient permits.

223. Bladder irrigation.—*a.* Bladder irrigation is the washing of the bladder. The equipment for this procedure is the articles needed for catheterization, a Y-shaped connecting tube, a 1,000-cc. irrigating can, a sterile solution of saturated boric acid, and rubber tubing. If the irrigation is carried out with the patient in bed, it is desirable to have a rubber operating pad or other protection for the bed and a bucket available to receive the return flow from the bladder. The irrigating container is placed about 12 inches above the patient's hips and the solution is allowed to flow through the tubing of the container until the air is expelled. The tubing is then attached to the inflow of the Y-tube, the stopcock is opened, and fluid allowed to flow into the bladder. Allow 250 cc. of the solution to flow into the bladder. Open the stopcock on the outflow of the Y-tube and allow the solution to run out of the bladder. Continue until a total of 1,000 cc. of solution has been used. Because of the restriction of the outflow at the beginning there is at all times in the bladder sufficient solution to bathe its walls thoroughly. Sterile technique is carried out during this procedure.

b. The bladder may also be irrigated by the syringe method; that is, the patient is catheterized and the irrigating solution is introduced into the bladder through the catheter by means of a syringe. A 30-cc. syringe is used and filled with irrigating solution. Usually 5 or 6 syringefuls are run into the bladder. Then the solution is permitted to drain out of the catheter.

224. Abdominal paracentesis.—Abdominal paracentesis is the withdrawal of fluid from the abdominal cavity through the abdominal wall. Sterile technique is required in this procedure. The procedure is usually performed under local anesthesia and the fluid removed is placed in a sterile container. A 2-cc. syringe and a small needle with 2 percent novocaine solution are used for producing anesthesia of the skin, superficial tissues, and muscles. The fluid removed is measured and generally forwarded to the laboratory for microscopic and cultural studies.

225. Ear irrigation.—Never use a sharp instrument, as it may puncture the drum of the ear or cause other injuries and abrasions with the introduction of infection which may be serious. When applicators are used for cleansing the auditory canal, the ends of the applicators should be tightly padded with absorbent cotton. Never use force in introducing the instrument or fluid. The patient may be in the sitting position or, if necessary, irrigation of the ear may be carried out with the patient lying in bed with his head turned somewhat to the side and slightly forward. Cleanse the outer ear of the auditory canal of its discharges or secretions with an absorbent cotton swab applicator. Place the irrigator can, containing usually boric acid solution, about 12 inches above the patient's head. Permit the fluid to run through the rubber tubing of the irrigator can to expel the air. Grasp the lobe of the ear and draw it gently downward and backward in order to straighten the canal. Direct the stream of the irrigation against the upper surface of the ear without force. The outflow from the canal should be continuous in order to remove foreign matter. Following the irrigation, the auditory canal should be dried with cotton swab and the external ear cleansed and dried. Sometimes a small piece of cotton is placed in the outer opening to retain medication which may be applied or to absorb remaining portions of the solution. All instruments used should be resterilized.

226. Gastric lavage.—Gastric lavage has been described in section II. The use of continuous or intermittent suction applied to the stomach or small Levine tube which has been introduced into the stomach is a frequently used surgical procedure. The tube is introduced either through the mouth or nose and is attached to a suction apparatus which permits the immediate and continuous removal of gastric secretions. It also permits the washing of the stomach by allowing the patient to drink water and then withdrawing it by the suction apparatus. The tube is kept in place by fastening it to

the nose or face with small strips of adhesive tape. The fluid intake by mouth and the drainage into the bottle of the suction apparatus must be carefully recorded. Frequent examination of the apparatus is necessary to insure its proper functioning. Gastric lavage should be performed only under the supervision of a medical officer except in certain cases of emergency such as ingestion of poison. The Wangensteen apparatus is a suitable suction apparatus and may be easily constructed or purchased from commercial hospital supply companies.

227. Conclusion.—The importance of the proper preparation of a patient undergoing a surgical operation and his care following operation has been emphasized. The careful attention to details and accuracy in the performance of all surgical procedures is mandatory. The medical department soldier will be capable of rendering valuable assistance in this field only after he has become thoroughly familiar with the basic information detailed in this and related sections.

SECTION IV

COMMUNICABLE DISEASES

228. General.—Communicable diseases are those which may be transmitted from one person to another. These diseases are caused by living organisms or germs which invade some part of the body. Communicable diseases include those which are often referred to as contagious, infectious, or epidemic diseases.

229. Definitions.—Certain words and terms as they apply to communicable diseases must be understood in order to care for and control these diseases. Some of the more common and important of these are listed below.

a. Isolation.—The separation of an infected person from direct or indirect contact with other persons.

b. Carrier.—One who harbors and transmits a disease without having the symptoms of the disease.

c. Excreta.—Respiratory secretions, feces, urine, vomitus, and sweat.

d. Discharges.—Includes excreta and any abnormal matter (pus, etc.) eliminated from the body.

e. Contaminated.—Soiled by the infectious agent or by discharges containing the infectious agent.

f. Disinfection.—The destruction or great weakening of the infectious agent by physical or chemical means.

g. Concurrent disinfection.—The application of disinfection *during* the contagious period.

h. Terminal disinfection.—The application of disinfection at the *end* of the contagious period.

230. Classification.—Communicable diseases may be classified according to the principal method of transmission.

a. Respiratory diseases.—The infectious agents are found in the discharges from the nose, throat, or lungs and are usually spread by coughing, sneezing, and spitting. Transmission may result directly by contact or indirectly by contaminated food, eating utensils, drinking cups, fingers, etc. Some examples of this group are the common cold, diphtheria, influenza, measles, mumps, pneumonia, pulmonary tuberculosis, and smallpox.

b. Intestinal diseases.—The infectious agent is eliminated from the body in the feces (also vomitus or urine in some cases) and is transmitted to others by means of contaminated water, milk, food, utensils, fingers, etc. Generally speaking, the infectious agent must be swallowed for infection to occur. Examples of this group include typhoid fever, amebiasis, bacillary dysentery, cholera, and common diarrhea.

c. Insect-borne diseases.—The infectious agent is transmitted from person to person or from animal to person by means of blood-sucking insects. Malaria, dengue, typhus fever, yellow fever, and Rocky Mountain spotted fever are examples.

d. Venereal diseases.—The infection is practically always transmitted by direct contact during sexual intercourse. Syphilis, gonorrhea, chancroid, lymphogranuloma inguidale, and granuloma inguinale are the venereal diseases.

e. Miscellaneous diseases.—This group includes—

(1) Diseases which are not transmitted by the methods outlined above, for example, trichophytosis, known also as "dhobie itch" or "athlete's foot", which is usually transmitted by indirect contact.

(2) Diseases which are not ordinarily transmitted from person to person, such as rabies, which is usually transmitted from animal to man by the bite of the animal, and tetanus, which is a disease caused by a wound infection.

231. Importance of nursing.—It can readily be seen that careful and expert nursing and ward management are important for the following three reasons:

a. Since most of these patients are acutely or even seriously ill, they require more attention and nursing care than ordinary patients.

b. The nurse or attendant must know how to minimize the chances of becoming infected with the disease himself.

c. Marked care must be exercised to prevent the transmission of the disease to other patients or persons.

232. Isolation technique.—By *isolation technique* is meant the method of applying and enforcing isolation.

a. Segregation may be accomplished by placing the patient in a—

(1) *Room* alone.

(2) *Ward* with similar cases.

(3) *Cubicle* prepared by hanging sheets or curtains around the bed.

b. The patient must not leave his room, ward, or cubicle.

c. Visitors are not allowed.

d. In most cases wear a cap and gown while in the patient's room. In some cases it is advisable to wear a mask, and sometimes rubber gloves. None of these articles are worn outside the room or ward. Gowns should be folded with the contaminated side (the outside) out if they are left in the room, whereas they are turned inside out if they are left just outside the room.

e. After any contact with the patient attendants should wash their hands and faces well. In any case, before leaving the room or ward, the hands should first be washed in soap and water (a pan of warm green or soft soap solution is ideal), then rinsed in water, and then immersed in a disinfecting solution, such as 70 percent ethyl or denatured alcohol, 3 percent cresol solution, or 1–2,000 solution of bichloride of mercury. The hands and face should always be washed again just before eating.

f. Avoid unnecessary close contact with the patient. Be particularly careful to avoid unnecessary contact with any discharge, and in handling any object contaminated by discharges.

g. The bed, room, and ward must be kept scrupulously clean. If the furniture, walls, or floor become contaminated by discharges they should be carefully washed with a disinfecting solution such as 3 percent cresol.

h. Disinfect dishes, utensils, food, and linen as follows:

(1) Dishes must be sterilized before being returned to the kitchen. They should be boiled if facilities permit. In small hospitals they

may be sterilized by soaking in 3 percent cresol solution for 30 minutes. In some cases it is advisable to keep the patient's dishes separated from those of other patients.

(2) Utensils may be handled in the same manner as the dishes

(3) Unused food is burned.

(4) Bedding and linen are collected separately and must be sterilized before being added to the other linen. Steam sterilization is preferable but, if this is not possible, sterilization may be accomplished by boiling or by soaking in 3 percent cresol solution for 30 minutes.

i. Disposal of excreta, dressings, and rags is accomplished as follows:

(1) Sputum and other discharges from the respiratory tract should be collected in paper cups.

(2) Soiled surgical dressings and cleaning rags are burned.

(3) Feces and urine are best sterilized, when necessary, by adding at least twice the amount of 3 percent cresol solution and allowing them to stand for at least 1 hour.

j. It is advisable for each patient to have an individual thermometer. Thermometers should always be kept sterilized.

k. The patient's room should be well screened. Insects should be searched for and destroyed. This applies even to those diseases which are not classified under insect-borne diseases, since any insect may become contaminated and thus act as a purely mechanical carrier and contaminate other objects.

l. Efficient vaccines or other immunizing substances are available for the prevention of many of the communicable diseases. Potential or actual attendants of cases of cholera, typhoid fever, yellow fever, and smallpox are always vaccinated or revaccinated.

m. Although venereal diseases are transmitted primarily by direct contact during sexual intercourse, it is occasionally possible for an "innocent infection" to occur. Separate latrines, or at least separate toilet bowls, should be reserved for venereal cases. Moreover, venereal cases should be further separated into groups of the same venereal disease. The hands of patients and attendants must be kept scrupulously clean, particularly after contact with venereal discharges. Gonorrhea may produce a very severe infection of the eyes, leading to blindness in some cases. Syphilis may be transmitted in certain stages by discharge from any ulcer or mucous membrane, including the mouth.

n. Immediately after the patient is undressed his clothing and equipment should be disinfected. Steam sterilization is the most effective procedure for this, but it causes injury to woolen cloth,

leather, and metal. Fortunately, in most of the communicable diseases, it is sufficient to thoroughly sun and air clothing and equipment. Before they are returned to the patient, woolens should be dry-cleaned, washable clothes laundered and, if advisable, certain items of clothing and equipment wiped with a disinfecting solution, such as 3 percent cresol. In each case, therefore, the method of disinfection will depend upon the orders of the medical officer.

o. When the patient is no longer a source of infection the following procedures are carried out:

(1) Bathe patient and give him clean clothing.

(2) Disinfect dishes, utensils, linen, and articles which may have become contaminated.

(3) Thoroughly clean room, bed, and furniture by washing with soap and water or a disinfecting solution as required. When possible, the room and bedding should be sunned and aired for 24 to 48 hours.

233. Special procedures and precautions in certain diseases.—Isolation technique, as usually practiced in the nursing and treatment of patients with communicable diseases, has been given in detail in the above paragraphs. The isolation technique for many of the diseases discussed hereafter should be practiced exactly as given above, although there are some variations that should be mentioned and certain points must be stressed. For this reason "concurrent disinfection" and "terminal disinfection" will be mentioned separately, although they are necessarily important parts of isolation technique as a whole. For the sake of brevity and simplicity as well as to avoid needless repetition of detailed technique, an outline form will be followed where possible. The same policy will be adopted in the presentation of "nursing care", since the general phases of this subject have been covered in preceding sections.

a. Respiratory diseases.—(1) *Common respiratory diseases.*—These include the common cold, pharyngitis, trench mouth, tonsillitis, and bronchitis.

(*a*) *Isolation technique.*—Desirable. The cubicle system of isolation is usually employed.

1. Concurrent disinfection.—Of respiratory discharges and articles contaminated by them.

2. Terminal disinfection.—General cleaning and airing.

(*b*) *Nursing care.*—General.

(2) *Influenza.*—(*a*) *Isolation technique.*—As for the common respiratory diseases.

1. Concurrent disinfection.—Of respiratory discharges and all articles contaminated by them.

2. Terminal disinfection.—General cleaning and airing.

(*b*) *Nursing care.*—During the acute illness allow latrine privileges only. In some cases weakness is very severe, and convalescence may be prolonged.

(3) *Diphtheria.*—(*a*) *Isolation technique.*—Strict and mandatory until ordered discontinued by the medical officer.

1. Concurrent disinfection.—Disinfection of all discharges and contaminated articles.

2. Terminal disinfection.—Thorough cleaning and airing.

(*b*) *Nursing care.*—Absolute bed rest is necessary for at least 2 weeks because of the danger of involvement of the heart. Gargles and throat irrigations are usually employed. Fluids are given in abundance. Be alert for evidence of difficult or noisy respiration, as this may indicate that the infection is spreading into the larynx or trachea. *Notify the medical officer at once* if there is the slightest sign of respiratory distress.

(4) *Measles.*—(*a*) *Isolation technique.*—As for the common respiratory diseases and until all abnormal discharges from the respiratory tract have ceased; a minimum of 5 days after the appearance of the rash.

1. Concurrent disinfection.—Of respiratory discharges and articles contaminated by them.

2. Terminal disinfection.—General cleaning and airing.

(*b*) *Nursing care.*—General. Darkening the room is not necessary unless the eyes are acutely inflamed, or unless patient complains of the light's hurting his eyes.

(5) *German measles.*—(*a*) *Isolation technique.*—As for the common respiratory diseases and for 1 week after the onset of respiratory symptoms.

1. Concurrent disinfection.—Of respiratory discharges and articles contaminated by them.

2. Terminal disinfection.—General cleaning and airing.

(*b*) *Nursing care.*—General.

(6) *Meningococcic meningitis* (*epidemic meningitis*, *cerebrospinal fever*).—(*a*) *Isolation technique.*—Rigidly applied until ordered discontinued by the medical officer. Caps and masks are worn.

1. Concurrent disinfection.—Vigorous disinfection of respiratory discharges and contaminations.

2. Terminal disinfection.—Thorough cleaning and airing.

(*b*) *Nursing care.*—Maintain absolute bed rest and quiet. Many cases are restless and delirious and constant attendance is necessary. Apply bed rails if they are available. Bed rails may be improvised.

(7) *Mumps* (*epidemic parotitis*).—(*a*) *Isolation technique.*—As for common respiratory diseases and until the inflammation of the salivary glands subsides.

1. Concurrent disinfection.—Of respiratory discharges and contaminations.

2. Terminal disinfection.—General cleaning and airing.

(*b*) *Nursing care.*

1. Mouth wash (such as normal saline, Dobell's solution, or liquor antisepticus) every 3 hours.

2. Liquid or soft bland diet.

3. Orchitis (inflammation of the testicles) is thought to be minimized by absolute bed rest and by avoiding even slight blows or rough handling of the testicles. If orchitis develops, support the testicles on a soft pad placed on adhesive tape fastened high across the thighs. Cold compresses or ice bags may be used.

(8) *Pneumonia, acute, lobar.*—Certain cases of primary bronchopneumonia are quite similar to acute lobar pneumonia, while others are secondary to many other diseases.

(*a*) *Isolation technique.*—As for common respiratory diseases. Single rooms are preferred.

1. Concurrent disinfection.—Of respiratory discharges and articles contaminated by them.

2. Terminal disinfection.—Thorough cleaning and airing.

(*b*) *Nursing care.*

1. Absolute bed rest is mandatory.

2. Do not let the patient talk, feed himself, or brush his own teeth.

3. Do not let patient sit up or turn in bed unassisted.

4. Gently wipe the secretions and discharges from his nose and mouth with a paper or gauze handkerchief. Do not let patient sit up or lean over to spit or cough.

5. Do not let him out of bed for any reason until the medical officer permits it.

(9) *Scarlet fever.*—(*a*) *Isolation technique.*—Employed until all abnormal discharges have ceased and, in any case, for a minimum of 3 weeks.

1. Concurrent disinfection.—Of all discharges and articles contaminated by them.

2. Terminal disinfection.—Thorough cleaning and airing.

(*b*) *Nursing care.*—Absolute bed rest is required. Give gargles or throat irrigations every 3 hours. Because of the fairly frequent complication of acute nephritis, the amount and appearance of the urine should be carefully observed and recorded.

(10) *Pulmonary tuberculosis.*—(*a*) *Isolation technique.*—Required even though certain cases may appear healthy and may have latrine privileges. A perfectly well feeling and appearing patient may disseminate countless numbers of tubercle bacilli every time he coughs, spits, or sneezes. He should be taught to use paper handkerchiefs every time he coughs or sneezes, to use his sputum cup and to keep it covered, and not to stand near anyone while talking.

1. Concurrent disinfection.—Of all respiratory discharges, particularly the sputum, and of all contaminated articles. Collect handkerchiefs and paper sputum cups in paper bags and burn them promptly. Disinfection of eating utensils is very important. Individual dishes are preferable.

2. Terminal disinfection.—Thorough cleaning and airing. Sun the room and furniture if possible.

(*b*) *Nursing care.*—Always be on the alert for possible hemorrhage from the lungs. Even blood streaking of the sputum calls for placing an ambulatory patient in bed until the medical officer has seen him. In frank hemorrhage—

1. Put the patient to bed and keep him there.

2. Place an ice bag on his chest.

3. Keep him still; reassure him; maintain quiet.

4. Notify the medical officer at once.

5. Keep all of the blood and sputum for measurement and inspection.

(11) *Smallpox.*—Smallpox is characteristically transmitted by intimate contact with the patient but, since the infectious agent is found in all discharges, it may be transmitted by indirect contact and is frequently classified as a respiratory disease.

(*a*) *Isolation technique.*—Very strict and rigid until all crusts and scabs have disappeared. Caps are always worn.

1. Concurrent disinfection.—Vigorous and prompt disinfection of all discharges and contaminated articles.

2. Terminal disinfection.—Thorough cleaning, washing with a disinfecting solution, and airing for 48 hours.

(*b*) *Nursing care.*

1. Apply olive oil or mineral oil to skin.

2. Wash the eyes frequently with boric acid solution.

3. Bandage the hands or apply cotton gloves.

4. Force fluids.

5. Cleanse the mouth frequently and gently.

(12) *Chickenpox.*—Chickenpox, like smallpox, is transmitted directly by contact with the patient, and indirectly by all discharges and contaminated articles. Chickenpox may be confused with smallpox, but they are entirely different diseases, and chickenpox is usually a much less serious disease.

(*a*) *Isolation technique.*—Applied for 10 days after the appearance of the rash.

1. *Concurrent disinfection.*—Of all discharges and contaminated articles.

2. *Terminal disinfection.*—Thorough cleaning and airing.

(*b*) *Nursing care.*—Only general care for mild cases; as for smallpox for severe ones.

b. *Intestinal diseases.*—In these diseases the infectious agent is eliminated primarily in the feces, but is also found in the vomitus and, in some diseases, in the urine. It should also be stressed that, for infection to occur, the infectious agent must usually be swallowed after being carried to the mouth by contaminated food, water, milk, fingers, dishes, or other objects.

(1) *Cholera* (Asiatic cholera).—(*a*) *Isolation technique.*—Rigidly enforced. Attendants must exercise strict personal precautions. Keep hands clean. Except for necessary food and drink, do not put anything in the mouth. Stay out of the kitchen.

1. *Concurrent disinfection.*—Vigorous and prompt disinfection of feces, vomitus, and all articles contaminated by them. Burn uneaten food. Linen is particularly liable to become grossly contaminated as vomiting may be frequent and diarrhea nearly continuous. Soiled linen is promptly sterilized by boiling or soaking in disinfectants.

2. *Terminal disinfection.*—Thorough cleaning, washing with a disinfecting solution, and airing for 48 hours.

(*b*) *Nursing care.*—Maintain intake of large quantities of fluids. Intravenous and subcutaneous salt solutions are required but, if it can be retained, a mixture of three parts of normal saline to two parts of water is very helpful by mouth.

(2) *Amebic dysentery—amebiasis.*—The term amebiasis is being employed more and more in this condition, since many patients do not have and have not had "dysentery"—an aggravated form of diarrhea.

(*a*) *Isolation technique.*—Always applied in acute cases. Applied in the cases of carriers and chronic cases until they have been instructed as to the nature of the disease and how to avoid transmitting it to others. They must be taught how to disinfect feces if sanitary sewage disposal is not available to them. They must wash their hands thoroughly immediately after using the toilet. They must not act as food handlers.

1. Concurrent disinfection.—Of feces and vomitus and objects contaminated by them.

2. Terminal disinfection.—Thorough cleaning.

(*b*) *Nursing care.*—Chart the number and character of the stools. Save one or more stools for daily inspection by the medical officer.

(3) *Bacillary dysentery.*—(*a*) *Isolation technique.*—As for cholera and until ordered discontinued by the medical officer.

1. Concurrent disinfection.—Of feces and vomitus and objects contaminated by them.

2. Terminal disinfection.—Thorough cleaning and airing.

(*b*) *Nursing care.*—Same as for amebiasis.

(4) *Typhoid fever.*—(*a*) *Isolation technique.*—Rigidly applied until ordered discontinued by the medical officer. In typhoid fever the typhoid bacilli (the germs which cause the disease) are also found in the urine.

1. Concurrent disinfection.—Of all feces, vomitus, and urine and of all objects contaminated by them.

2. Terminal disinfection.—Thorough cleaning and airing.

(*b*) *Nursing care.*—Excellent general nursing care is required since the typical case has fever and is very sick for at least 3 weeks. Some are delirious and require constant attendance and bed rails if available. Absolute rest and quiet are indicated. The diet is soft, with no roughage, but the caloric value is high. Adequate fluids are given. No cathartics are given. Change the position of the patient frequently, using pillows for support. Give special attention to bathing and care of the skin to prevent bedsores.

c. Insect-borne diseases.—(1) *Malaria.*—(*a*) *Isolation technique.*—Consists only of protecting the patient from the bites of mosquitoes, either by placing him in an adequately screened room or by the use of mosquito netting. The *Anopheles* mosquito transmits malaria.

1. Concurrent disinfection.—None. Destroy all mosquitoes in the sick room.

2. Terminal disinfection.—None. Make a final careful search for mosquitoes.

(*b*) *Nursing care.*

1. Chart the temperature and record the chills.

2. Apply blankets and external heat by hot-water bottles or heating pads during the chill.

3. There is profuse sweating and headache after the chill. Change pajamas and bed linen as they become wet. Apply an ice cap to the head. Force fluids.

(2) *Dengue.*—(*a*) *Isolation technique.*—Protection from the bites of mosquitoes for 5 days after the onset of symptoms. Dengue is transmitted by the *Aedes aegypti* mosquito.

1. Concurrent disinfection.—None. Destroy all mosquitoes in the sick room.

2. Terminal disinfection.—None. Make a final search for mosquitoes.

(*b*) *Nursing care.*—General.

(3) *Typhus fever.*—There are two forms of typhus fever, the more dreaded *epidemic typhus*, transmitted by body lice (cooties), and *endemic typhus*, transmitted by rat fleas. There is also some question as to whether other species of blood-sucking insects may transmit typhus fever in some cases.

(*a*) *Isolation technique.*—Keep the patient in an insect-free room.

1. Concurrent disinfection.—None. However, destroy all insects on the patient and in his environment.

(a) Destroy the vermin in his clothes and bedclothes by steam sterilization or by boiling.

(b) "Delouse" him—rid him of all insects and their eggs. Place him in a bathtub or, if he is too sick or a tub is not available, on a bed protected by a bedsheet over a rubber sheet. Then wash him thoroughly, applying soapsuds literally from head to foot. The most effective measure is then to shave the hair from his body. If universal shaving is not desired by the medical officer, apply vinegar thoroughly to loosen the eggs, and then wash with a solution of three parts of warm soapy water to one part of kerosene. Make a careful search for adult lice or eggs which may have escaped. The eggs (nits) may be attached to the hairs, and can be removed with a fine-toothed comb. (Character-

istically, however, the eggs and adults of the *body* lice are found in the seams of the clothing.)

(c) The attendant should use, a "louse repellant" such as four parts of naphthalene to one part of soft soap, on his clothing, cap, and gown; wear rubber gloves which extend over the lower ends of the sleeves of the gown; and wear "boots", preferably made of an impervious material such as oiled silk.

(d) Use an insect spray on the bed, furniture, and room.

2. Terminal disinfection.—None. Make a final careful search for insects.

(*b*) *Nursing care.*—General.

(4) *Yellow fever.*—The *Aedes aegypti* mosquito is the main insect concerned in the transmission of yellow fever, though recent evidence indicates that some other insect may transmit it in certain cases.

(*a*) *Isolation technique.*—Keep the patient in an insect-free room. Protect him primarily from the bites of the *Aedes aegypti* mosquito. Since this mosquito stays in and around human habitation by choice, it is safer to have each bed covered by mosquito netting, even though the bed is in a well screened room or ward. It is also well to know that the *Aedes aegypti* characteristically bites during the daytime. The patient cannot infect the mosquito after the first 4 days of the fever.

1. Concurrent disinfection.—None. Destroy all insects in the sickroom.

2. Terminal disinfection.—None. Make a final careful search for insects.

(*b*) *Nursing care.*—General. Observe and record the number and character of stools, and amount and character of the vomitus and urine.

d. Tetanus (*lockjaw*).—Strictly speaking, tetanus is not a communicable disease. It is an acute infectious disease caused by the toxin of the tetanus bacillus which has infected a wound. Puncture wounds, contused and lacerated wounds, and gunshot or high-explosive wounds are especially prone to be infected by the germs of tetanus. Tetanus can be prevented by the administration of *tetanus toxoid before* the incurrence of a wound or by the administration of *tetanus antitoxin* (ATS) *after* a wound is incurred.

(1) *Isolation technique.*—Not required, though "isolation" is necessary to insure absolute quiet.

(*a*) *Concurrent disinfection.*—None. However, soiled dressings from any remaining wound should be promptly disposed of by burning.

(*b*) *Terminal disinfection.*—None.

(2) *Nursing care.*—(*a*) *Maintain absolute quiet and be extremely gentle.* Even very slight noises or the slightest jarring of the bed may cause a convulsion.

(*b*) Intravenous, subcutaneous, or rectal fluids and rectal or nasal feedings are required.

(*c*) Intravenous, hypodermic, or rectal sedatives are required to keep the patient comfortable and to prevent and control convulsions.

Section V

DENTAL PROCEDURE

234. General.—Specific instructions for the care and treatment of dental patients are given by the dental surgeon when hospitalization is required. These will vary according to the nature and character of the dental disability. However, there are a few routine measures with which the ward attendant should be familiar.

235. Preoperative cases.—The most frequent dental causes for admission to the hospital during the absence of a dental officer are jaw fracture, root abscess, toothache, and trench mouth. These cases should be referred to the dental surgeon or, in his absence, to the ward surgeon at the earliest possible convenience for necessary emergency treatment.

a. Jaw fracture.—Fracture of the jaws is usually accompanied by pain, the amount depending upon the nature, location, and severity of injury. As in the care of any sick patient, the first requisite of good hospital care is to relieve the pain and make the patient as comfortable as possible. The usual measures to follow in these cases are as follows:

(1) For the relief of pain, codeine sulfate ½ gr., and aspirin 10 gr. In severe injuries, with intense pain, morphine may be indicated.

(2) The patient should be put to bed in a semi-inclined position, with the head slightly raised.

(3) Do not apply a head bandage unless specifically indicated to stabilize and support loose bone fragments or extensive soft tissue

injury. If a bandage is used, it should not be applied too tightly, as this will tend to displace the parts backward, increasing the patient's pain and interfering with breathing.

(4) Give the patient a warm saline mouth wash and instruct him to use it frequently. (Avoid the use of hydrogen peroxide or sodium perborate mouth washes.)

(5) Place on a liquid diet.

b. Root abscess (*alveolar abscess*).—A patient with an alveolar abscess should be given a sedative, if feeling marked pain. An ice cap should be applied to the affected side of the face; avoid the use of hot applications externally.

c. Toothache (*pulpitis*).—The patient is instructed to brush the teeth thoroughly and free the offending tooth as much as possible of food particles or other debris. Paint the surrounding gums with 3½ percent iodine in glycerine and carefully insert into the cavity a pledget of cotton moistened in eugenol. If this procedure fails to give relief after a reasonable length of time (10 to 20 minutes), a sedative may be given and applications of cold applied to the aching tooth. Cold water or ice will often afford temporary relief should the tooth be in a stage of abscess formation.

d. Trench mouth (*Vincent's infection*).—Trench mouth is a communicable disease and all reasonable precautions must be observed to prevent the spread of the infection. The following orders must be observed in the treatment of these cases:

(1) Caution the patient as to the infectious nature of the disease and instruct him to use his own towel, toilet articles, and drinking utensils.

(2) Have the patient rinse his mouth thoroughly every few hours with one of the following mouthwashes:

(*a*) Sodium perborate—1 teaspoonful to ½ glass of warm water.

(*b*) Equal parts of hydrogen peroxide and water.

(*c*) Potassium permanganate 1–2,000 dilution.

(3) Direct patient to brush the teeth carefully with a soft brush and tooth paste after each meal.

(4) Place the patient on a soft diet, including orange and tomato juice.

236.—Postoperative care in the ward.—*a. Following removal of impacted teeth, multiple extractions and alveolectomy, and other intraoral surgical operations.*—Specific treatment must be administered in the ward to alleviate the pain, to reduce the liability of infection about the field of operation, and to keep to a minimum the amount of tissue swelling. Ward instructions are usually as follows:

(1) An ice cap to affected parts immediately following return to ward for a period of 4 hours (intermittent application—on 30 minutes, off 30 minutes).

(2) The patient is not permitted to rinse his mouth for 4 hours to prevent a disturbance in the formation of a normal blood clot. The patient may have water to quench his thirst.

(3) After 4 hours discontinue the use of the ice cap and have the patient rinse his mouth with a warm salt solution. The patient should be cautioned to use the mouthwash mildly, and not forcefully to agitate between the jaws, in order to prevent the entrance of air into the tissues.

(4) Following operations, for the relief of pain administer codeine sulfate ½ gr. (0.032 gm.) and aspirin 5 gr. (0.324 gm.) and repeat every 4 hours if needed, for the first night only.

(5) The patient is placed on a soft or liquid diet. For cases without teeth, soft diet to be continued until dentures are provided. These instructions, complete or in part, as checked by the dental officer, should be carried out in the ward by the ward attendants.

b. Following fractures of jaw.—When fractures of the jaw have been reduced and immobilized by the dental surgeon, it is the duty of the ward attendant to acquaint himself with the necessary procedures in the specific care and treatment of that patient. Ward orders are as follows:

(1) Place the patient on a liquid diet, unless otherwise prescribed, with feedings from 7:00 AM to 9:00 PM, at 2-hour intervals.

(2) Direct patient to rinse the mouth with warm salt solution after each feeding.

(3) Direct patient to clean the teeth with a tooth brush as well as possible a minimum of three times daily.

(4) If the patient should strangle due to nausea, an acute asthmatic attack, or some other cause, cut the vertical wires holding the jaws together or remove the intermaxillary elastics which are commonly used for intermaxillary traction and fixation. Each patient with intermaxillary wires is provided with a small pair of scissors for this purpose, which should be suspended by a cord around the neck of the patient at all times.

(5) Record the patient's weight weekly.

c. Postoperative hemorrhage.—(1) Examine the patient carefully to determine the point of origin of the hemorrhage. Extensive bleeding from the soft tissues may usually be checked by having the patient remain quiet and holding sterile gauze over the affected area

with digital pressure. The application of cold directly to the bleeding area or, where this is not practical, to some related area is also helpful.

(2) In the case of a bleeding tooth socket following the extraction of a tooth, if any large blood clots have formed in the patient's mouth, these should be removed. A piece of sterile gauze folded about the size of a walnut is placed over the socket and the patient instructed to close firmly on the pack. If this is held for 10 to 15 minutes with constant pressure and then carefully removed, the hemorrhage is usually arrested. As a supplement to the pressure, the patient should be placed in bed, keeping the head higher than the body, and sedatives should be administered to lower the blood pressure; avoid all stimulants.

Section VI

VETERINARY PROCEDURE

237. General.—The proper care of animals aims at keeping them at their highest degree of military efficiency by the prevention of disease and injury. Most diseases and injuries are preventable if all concerned are vigilant, intelligent, and untiring in the application of simple preventive measures. Frequently the development of serious diseases or injury can be prevented by prompt first-aid measures and early treatment. The treatment of disease and injury among animals, as well as prevention of disease, is one of the functions of the Veterinary Corps, and present organization provides that the services of a veterinary officer or trained enlisted man of the veterinary service will be available under practically all situations.

238. The horse in health.—Health is the condition of the body in which all the functions thereof are performed in a normal manner. It is particularly essential that the normal functions of the body of the animal be thoroughly understood, or else one cannot hope to recognize quickly any departure therefrom. Even the most elementary study of diseased conditions must be founded upon a very thorough knowledge of the normal body.

a. Posture.—The standing posture is the most common posture of the horse. Normally the front feet will both be on the same transverse line and bear weight equally. Any other posture of a forefoot is spoken of as "pointing" and is an indication of trouble. The hind

legs are rested alternately; rarely does the horse stand with both hind feet squarely together on the ground; in fact it is difficult to make him take or maintain this position. Due to certain peculiarities of structure the horse can maintain the standing position without tiring and can sleep standing. Some horses never lie down, but no doubt they would rest better and their legs would last longer if they took their rest lying down. The horse lies down either obliquely on the chest with the legs somewhat folded under the body and head extended with the chin or teeth on the floor, or flat on his side with the legs and head extended. The horse is a very light sleeper, sleeping with his eyes partly open, but gets his deepest sleep and greatest rest when lying down.

b. Expression.—The expression should be alert but without evidence of fear or excitement. The normal horse notices what is going on about him; his eyes are bright and his ears are frequently moved toward the direction of sound.

c. Mucous membranes.—The visible membranes of the eyes and nostrils are a bright pink and there should be no discharge from either of these organs. The nostrils may be moist with tears flowing from the opening of the tear duct but they are relatively clean.

d. Appetite.—The appetite will be good, and unless overfed the horse will show an eagerness for his forage rations. He should readily consume an average (3 to 4 pounds) feed of grain.

e. Skin.—The skin is loose, supple, and easily moved about over the structures underneath. One should be able to pick up a handful of skin with ease. The coat is smooth, sleek, and glossy. During cold weather the hair may stand up and the coat becomes coarse and heavy. The old coat should be shed quickly and easily in the spring.

f. Pulse.—The normal pulse rate varies from 36 to 40 per minute, depending upon the age, sex, temperament, and breeding of the horse. The pulse rate increases with exercise or excitement. The rate after a 5-minute gallop will be 60 or 70 per minute. After very strenuous work the rate may be as high as 80 to 90. In a horse that is well conditioned the rate should return to approximately normal in a few minutes after exercise. The pulse rate will not return to the normal rate at rest as rapidly as the respiratory rate will subside. The pulse should feel strong, full, and regular. It is determined by placing the tips of the fingers on an artery and counting the pulsations for 15 to 30 seconds at least twice, averaging the counts and multiplying the average by four or two, according to how many seconds were counted. The artery most commonly

used is the maxillary, and the count is made where it rounds the lower jawbone in front of the large cheek muscle.

g. Respiration.—The breathing should be free, soft, and noiseless. After fast work the breathing is heard as a rushing sound of air but there should be no harsh, fluttering, whistling, or roaring sound. The breathing rate per minute is approximately as follows:

At rest	9–12
After walking 200 yards	28
After trotting 5 minutes	52
After galloping 5 minutes	52–70

The above rates are for horses in good condition. After cessation of exercise the breathing rate should subside quickly to normal. The quickness with which the breathing rate subsides is an excellent indication of the fitness or condition of the horse. The breathing rate increases with exercise more rapidly than the pulse rate and after work subsides more quickly than the pulse rate. The breathing rate is counted by watching the rise and fall of the flanks, the movements of the nostrils, or on a cold day the steamy expiration of breath.

h. Temperature.—The normal body temperature of the horse at rest is about 100° F., but may vary 1° in either direction; however, a temperature of 101° F. is uncommon. The temperature varies with exercise and excitement and air temperature. One hour's work at walk and trot may raise the temperature one or two degrees. Hard, fast, or prolonged work, especially under a hot sun may build the body heat up to 103° to 105° F. When the temperature reaches this reading the horse is approaching "overheating." The temperature is taken with a clinical thermometer in the rectum. The thermometer is moistened or oiled, the mercury is shaken down to 96° or below, and the bulb of the thermometer is inserted in the anus and allowed to remain 3 minutes, when it is withdrawn and the temperature noted.

i. Urine.—Urine is passed several times daily in quantities of a quart or more. During the act of urination, the animal straddles, grunts, and assumes a very awkward position that might be mistaken for pain. Lack of water and profuse sweating decreases the amount of urine voided. Some horses hesitate to urinate on a hard floor, but habitually wait until placed on bedding. The urine of the horse is a thick, yellowish fluid and at times cloudy.

j. Defecation.—(1) Defecation occurs 8 to 10 times in 24 hours. Normal droppings should be fairly well formed but soft enough to flatten when dropped; free from offensive odor or mucous slime; vary in color from yellow to green, according to the nature of the food; and not filled with grains that are either wholly or partially

unmasticated. The amount of droppings passed in 24 hours varies from 36 to 40 pounds, depending upon the size of the animal and the amount of food given.

(2) Because the droppings are a good indication of the condition of the teeth and the digestive tract, an examination of the fresh droppings should be made frequently. An examination may reveal the following irregularities:

(*a*) Hard droppings may indicate a lack of water, a lack of exercise, too dry and indigestible food, or a combination of all of these. This can be corrected by giving a few bran mashes, by watching the watering, by grazing, and by an hour of exercise daily.

(*b*) Very soft or watery droppings may indicate too hard work, fatigue, too much grazing, excessive use of bran, or a slight irritation of the intestines. Reduce the work; omit bran and grazing. If it persists, withhold all food for 24 hours.

(*c*) Slimy or mucous covered droppings or those having an offensive odor indicate too highly concentrated food or an irritation of the intestines. Reduce the food; give bran mashes and plenty of water.

(*d*) Unmasticated grains indicate that the teeth are sharp or diseased, or that the animal eats too rapidly. Have the teeth examined; feed chop and dry bran with the grain.

239. Indications of disease.—Every disease has different indications, and the symptoms vary so greatly that only exhaustive study can acquaint one with these many indications.

a. The most common preliminary indications of disease are partial or complete loss of appetite, elevation of temperature (101° F. or more), accelerated breathing, increased pulse rate, listlessness, dejected countenance, profuse sweating, stiffness, nasal discharge, cough, diarrhea, constipation, pawing, rolling, lameness, inflamed mucous membranes, unhealthy coat of hair, itching, or unnatural heat or swelling in any part of the body.

b. The best time to inspect animals for evidence of sickness or injury is while they are being fed and at time of grooming. One of the first and most important symptoms of sickness is impairment of appetite. Take the temperature of animals that refuse their feed. Sick animals in a corral are inclined to stand by themselves.

240. Nursing.—Good nursing is indispensable in the treatment of sick and injured animals. It implies the attention to every detail which conduces to the comfort or benefit of the patient. The chief points to consider in nursing are:

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a. Ventilation.—Allow plenty of fresh air but protect from draughts. Avoid extremes of temperature, and in the field provide shelter from wind and rain.

b. Clothing.—The amount of clothing must be regulated by the climate. In winter woolen bandages on the legs are useful, and as many as three or four covers may be used. In summer fly sheets are extremely comforting.

c. Bedding.—A good clean bed induces an animal to rest and produces a soft springing surface for foot cases. It should be shaken up several times daily and be kept free of urine-soaked straw. Animals which are weak from illness will occasionally lie down for days at a time and require considerable attention to prevent the occurrence of decubitus (bedsores). These are pressure galls on those regions where the weight of the animal is greatest when lying, and occur on the outside of the shoulder and point of the hip and stifle. To prevent these cases the patient should be turned over from time to time and the bedding leveled and kept thick and soft.

d. Stalls.—A roomy box stall, well bedded, should be used whenever possible. Keep a bucket of water in the stall and change the water frequently. Patients suffering from severe abdominal pain and those exhibiting certain central nervous disturbances may throw themselves so violently they become seriously injured. For these cases a large stall should be provided which is tight, free from mangers or other projections, and preferably equipped with a "knee board." A knee board is a heavy false partition about 4 feet high with its lower edge set in the stall 2 feet to reduce the right angle of the floor and stall sides. A thick bed of sawdust affords good protection for violent cases.

e. Shoes.—The shoes may be removed and the feet leveled if the animal is to remain in a stall for more than a few days.

f. Exercise.—Convalescent patients should receive just as much exercise as each individual case permits. It must be borne in mind, however, that absolute rest is frequently the best treatment.

g. Grooming.—Animals that are weak and depressed should not be worried with unnecessary grooming. Such animals should be carefully hand rubbed at least once a day, and their eyes, nostrils, and docks should be wiped out with a sponge or soft cloth. The feet should also be cleaned. Animals that are only slightly indisposed should be groomed in the usual way.

h. Food.—Some sick animals retain a good appetite. The principal things to observe in their cases are that they are not overfed, that droppings are kept soft, and that they have plenty of water. Sick

animals with impaired appetites require special attention. They often relish a change of diet, a bran mash, steamed oats, chopped alfalfa, grass, roots, and apples. Feed small amounts often; do not allow uneaten portions to remain in front of them; keep mangers and feed boxes clean; induce eating by hand feeding; sprinkle a little sweetened water over the hay and grain. The forced feeding of liquid foods by means of the stomach tube or enema may be used as a last resort.

241. Medication.—Frequent medication for the average sick animal is unnecessary and may even be harmful. Medicines are administered to animals through the same agencies as to man. They are introduced into the mouth by means of capsules placed on the back of the tongue with a "balling gun"; liquids are injected into the pharynx with a dose syringe or gravitated directly into the stomach through a stomach tube. Any of these methods require a technique which can be learned only by personal instruction and practice, and all of them are more or less dangerous to the patient when attempted by a novice. Until the animal nurse has learned by supervised practice to administer medicine he should not attempt it, as more harm than good may result. In some cases medicines are administered by placing them in the food or water.

242. Records.—Ward records include a list of property pertaining to the ward, individual feeding and watering instructions (usually indicated on a card on heel post or stall door), any special instructions as to care and treatment, and such clinical records as may be necessary. (See sec. VI, ch. 6.)

CHAPTER 5

APPLIED HYGIENE AND SANITATION

SECTION I

GENERAL

243. Responsibility for sanitation.—Military sanitation is the use in the military service of practical measures for the preservation of health and the prevention and control of disease. Its primary purpose is to maintain the maximum effective strength of the military personnel.

FIGURE 57.—Factors in the control of communicable diseases.

244. Communicable diseases.—For definition, cause, and classification see paragraphs 228 to 230.

a. Sources.—(1) A person who is actually ill with a disease is spoken of as a *case*.

(2) A person who, although not ill, is giving off from his body organisms or viruses capable of causing disease is known as a *carrier*. Some of the diseases known to be spread frequently by carriers are typhoid fever, diphtheria, meningococcic meningitis, and various types of dysentery.

(3) In certain diseases, such as bubonic plague and Rocky Mountain spotted fever, the source may be an infected animal.

b. Susceptibility.—A *susceptible* person is one who will develop the disease if infected with the organisms of that disease.

c. Immunity.—A person is *immune* to a given disease when the tissues of his body have developed the power to combat and overcome the specific organisms or the poisons produced by them. A person may be rendered immune or nonsusceptible to some diseases by an attack of the disease. An attack will confer a more or less permanent immunity to chickenpox, measles, mumps, scarlet fever, smallpox, typhoid fever, and a few other and less common diseases. Immunity to typhoid fever and smallpox can be conferred by vaccination, and vaccination against these diseases is required by Army Regulations.

245. Control measures.—*a.* The following measures should be used to prevent the spread of communicable diseases.

(1) Control of sources by supervision of cases and carriers.

(2) Control of transmitting agencies by—

(*a*) Proper ventilation of barracks and tents.

(*b*) Prevention of overcrowding.

(*c*) Purification of water.

(*d*) Proper sanitation of messes.

(*e*) Proper waste disposal.

(*f*) Control of disease-bearing insects.

(3) Protection of susceptibles by the use of all possible measures for improvement of general health.

(4) Vaccination against smallpox, typhoid fever, and such other diseases as may be directed by competent authority.

(5) Instruction of all individuals in personal hygiene, and the rigid observance by them of its rules.

b. In the application of control measures against communicable diseases, the following terms are frequently used:

(1) *Contact.*—A person who has been closely associated with a sick person is known as a contact.

(2) *Suspect.*—A person who has been exposed to a communicable disease and is ill, but in whom the symptoms and signs present are insufficient to warrant a diagnosis of the particular disease, is spoken of as a suspect.

(3) *Isolation.*—In the Army, cases of communicable diseases are hospitalized if possible, and are there kept separate from other persons. This is termed "isolation."

(4) *Incubation period.*—The incubation period of a disease is the time between exposure and the earliest symptoms of the disease. It varies with different diseases and in different persons.

(5) *Carrier.*—See paragraph 244*e*(2).

(6) *Quarantine.*—(*a*) Quarantine is the separation from other people of carriers or of the contacts of a case of communicable disease to prevent the spread of the disease to the unexposed members of the command. Quarantine may be applied to one or to a large number of persons.

(*b*) Quarantine may be absolute or modified.

1. In *absolute* quarantine the carriers and contacts of a communicable disease are completely isolated or confined so that they are entirely separated from all other persons. This type of quarantine is seldom employed in the Army.

2. *Modified* quarantine, termed "working quarantine", is ordinarily employed. In working quarantine the group involved are messed and quartered together and are separated from all other persons but continue to carry on such training or other activities as do not bring them into close association with persons outside the contact group. All members of the quarantined group are examined once or twice daily by a medical officer. Any individuals showing suspicious symptoms are immediately isolated.

(*c*) Quarantine is continued until a time equal to the longest usual incubation period of the disease concerned has elapsed since the last case developed in the group.

SECTION II

PERSONAL HYGIENE

246. General.—*a.* Personal hygiene deals with the efforts each individual must put forth to keep in good physical condition and with the precautions he must take to protect himself from disease. Before being allowed to enlist in the Army, the soldier is given a thorough physical examination to determine the absence of disease.

It then becomes his duty to keep himself in the best possible physical condition. In so doing, attention to personal hygiene is of great importance.

b. If at any time a soldier feels sick or for any reason believes that he has contracted a disease, he should report at once to his first sergeant or to the noncommissioned officer in charge of quarters, who will send him to a medical officer for examination. Soldiers should never try to treat themselves, since nearly all medicines may be harmful or possibly even fatal in unskilled hands. Furthermore, a sick person may be a source of danger to his associates.

c. Most acute diseases and many chronic ones are caused by tiny organisms or viruses commonly called "germs." These are much too small to be seen with the naked eye. The usual ways in which disease-producing germs gain entrance to the body are as follows:

(1) By food or water or other liquids which contain the germs.

(2) By inspired air in which certain germs float.

(3) Through the skin, the germs having been injected into the body by the bites of mosquitoes, lice, ticks, or fleas, or introduced through cuts, scratches, or abrasions.

(4) By contact with diseased persons.

247. Measures to protect and improve health.—*a.* Every individual has some degree of natural resistance to infection. This natural resistance is improved by any measures which serve to improve his general health. Among measures serving that purpose are the following:

(1) Protection from cold and chilling by suitable clothing, blankets, and housing facilities.

(2) Adequate and proper food.

(3) Physical training, including athletics.

(4) Sufficient sleep (at least 7 to 8 hours each night).

(5) Avoidance of undue fatigue. (This is particularly important in training camps in the presence of epidemics of respiratory diseases.)

(6) Recreation of suitable nature. (The morale of an organization has a very definite relation to the phyical condition of its members.)

b. An unclean body may favor the entry of disease germs. Therefore, the entire body should be bathed at least twice a week, and oftener if possible. The hands should always be washed before eating and after going to the toilet. When facilities for a complete bath are not available, the body should be frequently scrubbed with

a wet cloth, paying particular attention to the armpits, crotch, and feet.

c. Underwear and shirts should be changed and washed at least twice a week. If water is not available, clothing should be crumpled up, shaken well, and exposed to the sun for at least 2 hours.

d. It is very important to brush the teeth at least twice a day, one of these brushings to occur before going to bed. In cleaning the teeth, brush the inside and outside surfaces away from the gums and toward the cutting surfaces. Particles of food between the teeth should be promptly removed, care being taken not to injure the gums.

e. The most important factor in the marching ability of the soldier is the care of the feet. Serious defects of the feet can be prevented by properly fitted shoes and socks and by proper care of the feet.

(1) *Shoes.*—(*a*) Only field shoes issued by the Quartermaster Corps should be worn in the field by enlisted men. Each shoe is fitted to the foot of the wearer so that no undue constriction or pressure will occur at any point when the foot is expanded by the weight of the body and pack. It is equally important that shoes not be so large as to permit friction by the foot's slipping inside the shoe. Shoes can be properly fitted only by actual test.

(*b*) To test, the shoe is laced snugly, and the wearer with a 40-pound burden on his back places his entire weight on the foot wearing the shoe. The leather of the shoe in front of the instep above the ball of the foot should then be grasped between the fingers and thumb. As the finger and thumb are brought together, the leather should be loose enough to prevent the fingers' slipping easily over the surface but not sufficiently lax to produce a wrinkle. If it wrinkles under the grasp, the shoe is too wide, and if there is no looseness apparent, it is too narrow. The proper length of the shoe is determined by measuring the space between the end of the great toe and the end of the shoe. This space should be not less than three-quarters of an inch when all the body weight plus that of a 40-pound burden is borne by the foot being fitted. This space is measured by pressing down the leather with the thumb. The width of the thumb may be considered as representing the desired width between the toe and the end of the shoe.

(*c*) All shoes should be well broken in and adjusted to the feet before being used for marching.

(2) *Socks.*—Only woolen socks (light or heavy) should ordinarily be worn for marching. Socks should be large enough to permit free movement of the toes but not so loose as to permit wrinkling.

Woolen socks should be one-half size larger than cotton socks in order to allow for shrinking. Darned socks or socks with holes in them should never be worn on the march, since they will cause abrasions and blisters. Wearing two pairs of socks will aid in preventing friction between the shoes and feet.

(3) *Feet.*—(*a*) Clean feet are as important to the avoidance of foot defects as are properly fitted shoes and socks. The feet should be washed and the socks changed each day. This is especially important on a march. As soon as possible after reaching camp after a march, the feet should be washed (not soaked) with soap and water and the soldier should then put on clean socks and change his shoes.

(*b*) If blisters have appeared on the feet they should be painted with iodine and emptied by pricking them at the lower edge with a pin which has been passed through a flame. The skin should not be removed. The blister should then be covered with a dressing. Serious abrasions on the feet, corns, bunions, and ingrowing nails should be treated at the dispensary or aid station.

(*c*) The toenails should be kept short and clean. They should be cut straight across to avoid ingrowing nails.

(*d*) "Athlete's foot" is a common and frequently irritating foot infection. It should be treated only by a medical officer or as ordered by one. Unskilled treatment will often make the condition worse instead of curing it.

f. Following are some of the rules which should be followed by every person in order to protect his health and the health of other people, especially during service in the field.

(1) *Do not* drink water which has not been declared potable by a medical officer unless it has been purified by boiling or chlorination. Do not take water from a water sterilizing bag by dipping a cup into the bag or putting mouth to faucet.

(2) Do not soil the ground with stools or urine. Always use the latrine or the night urine can provided in the company street.

(3) Be sure that the mess kit, knife, fork, and spoon are thoroughly washed in hot, soapy water and rinsed in hot, clear water after they are used.

(4) Use a mosquito bar in regions where mosquitoes are present. See that it is well tucked in and is free from holes.

(5) Do not sit or lie directly on the damp ground. Avoid drafts when perspiring or while the clothing is damp.

(6) Ditch the tents as soon as put up, even if the camp is for only one night.

(7) Prepare the beds before dark. In temporary camps or bivouacs, raise the beds if suitable materials such as straw, leaves, or boughs can be obtained. The raincoat can be used as a ground sheet.

(8) Never use a cup which is used by others. Do not exchange pipes, cigars, musical instruments played with the mouth, gas masks, handkerchiefs, towels, or shaving outfits.

(9) Water discipline is essential. No water should be drunk from springs, wells, or other unauthorized sources along the route of march. The amount and rate of consumption of water should be controlled by company officers. During a march of 15 miles in average summer temperature, about 2 quarts of water and considerable salt are lost from the body in perspiration. Unless these are replaced there is marked thirst and exhaustion, the loss of salt being equal in importance to the loss of water. Replacement of salt can be accomplished by adding 1 teaspoonful of common table salt to each canteenful of water. This is advisable during hot weather, it is not necessary in cool weather. Men are encouraged to drink all the water they need before starting a march; they are cautioned to drink sparingly during the course of the march. Canteens should be completely filled at the start of the march, and provision made for refilling them at about the midpoint of the day's march. During very hot weather, too rapid consumption of water which does not contain salt will result in excessive perspiration, diarrhea, nausea, and fatigue. Thirst may be relieved somewhat by chewing gum or keeping a pebble in the mouth while marching. Some individuals find that a canteenful of weak tea quenches the thirst more satisfactorily than does plain water. This custom has some merit but hardly enough to justify the trouble involved in preparing the tea. Commanders are required to have all water for drinking and cooking purposes chlorinated unless procured from a source found to be safe by the medical service. They make the necessary arrangements for the replenishment of canteens in accordance with anticipated needs; they permit no straggling from the column for this purpose. In large commands, replenishment of canteens from local sources is often impracticable; therefore water must be transported in water vehicles or tank trucks. Troops exercise economy in the use of water in order to make the available supply suffice for the march. When combat is in prospect, the replenishment of water consumed during the march requires special attention. Animals suffer more from lack of water than from lack of food. If insufficiently watered, they rapidly lose condition. The times of watering are largely dependent upon march conditions and available facilities.

(10) Acquire the habit of having the bowels move regularly once each day and at as nearly the same time as possible.

(11) Wear clothing of proper weight for the climate. Clothing should fit loosely. Wet clothing, particularly shoes and socks, should be changed as soon as possible.

(12) Keep the hair cut short and the fingernails clean.

(13) Never throw pieces of food or refuse around the camp or in the trench. Such debris attracts flies, and flies carry disease organisms.

(14) If possible, avoid all contact with diseased persons.

(15) Avoid venereal diseases. These diseases are almost always contracted by sexual intercourse with an infected woman. If sexual intercourse is had, report as soon as possible (value decreases with every hour's delay) to the hospital or other designated place for "prophylaxis." This prophylactic treatment must be carried out thoroughly and the directions followed exactly if its full protective value is to be obtained.

(16) Relax completely during rest periods on a march.

SECTION III

PREVENTION AND CONTROL OF RESPIRATORY DISEASES

248. General.—Respiratory diseases are the most common cause of admission to sick report. They are particularly frequent during the winter and spring and when large groups of recruits are assembled. They are spread in the secretions of the respiratory tract and may be transmitted by air, hands, food, mess equipment, or anything else which comes in contact with secretions from the mouth or nose. The principal respiratory diseases are—

Bronchitis, acute.
Chickenpox.
Coryza (common cold).
Diphtheria.
Influenza.
Laryngitis, acute.
Measles.
Meningitis, epidemic.
Mumps.
Plague, pneumonic.
Pneumonia.
Poliomyelitis.
Scarlet fever.
Tonsillitis, acute.
Septic sore throat.
Smallpox.
Tuberculosis, pulmonary.
Vincent's angina.
Whooping cough.

249. Control measures.—*a.* Control measures are chiefly directed at the transmission agencies and at increasing and maintaining the group resistance.

b. (1) Poor ventilation of barracks or quarters causes the occupants to exchange organisms by rebreathing each other's expired air, the germ content of which is increased by coughing and sneezing.

(2) The air in sleeping quarters should have a movement easily felt on the back of the hand but without uncomfortable drafts. A properly ventilated room will not feel stuffy or hot when entered. For practical purposes, whether or not a barracks is properly ventilated may be determined by the temperature as shown on the thermometer and by the effect of air movement on one's senses. The temperature range should be 64° to 70° F. Overheating, as shown by the thermometer, means poor ventilation regardless of its cause.

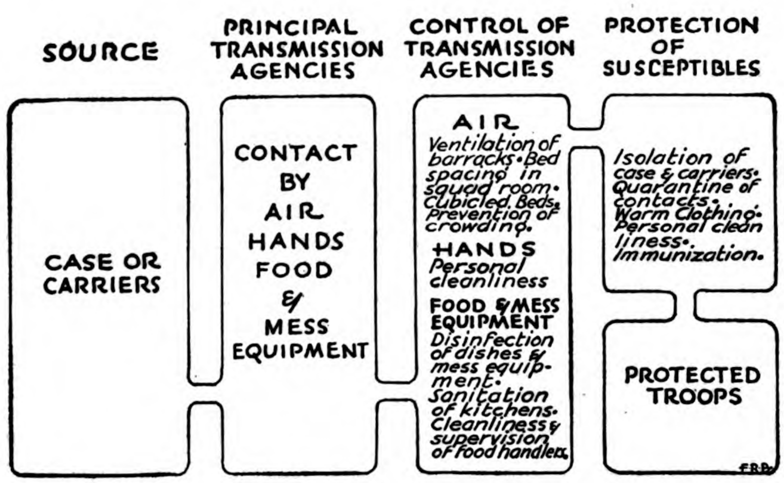

FIGURE 58.—General factors in the control of respiratory diseases.

(3) There are two methods of ventilation, natural and mechanical. Natural ventilation is usally obtained by opening windows at the bottom on the windward side and at the top on the other side. The area of these openings depends upon the number of occupants, the velocity and direction of the wind, the difference in temperature between the indoor and outdoor air, and the construction of the building. If the windows are on one side only, or if the inlet and outlet are at the same level, the air will be short-circuited with an uneven distribution in the room. Drafts can be prevented by having several small inlets rather than a few large ones. Also, the use of deflectors in the window openings aids in decreasing drafts.

(4) If troops are quartered under canvas, the sides of the tent should be rolled up daily and the hoods opened, weather permitting.

(5) Noncommissioned officers in charge of quarters should check the window ventilation several times each night, especially during the respiratory disease season, November to April.

c. (1) In barracks, each man should have a floor space of 60 square feet. In extreme emergencies the minimum allowance may be reduced to 50 square feet of floor space per man. With double decker bunks the standard should be 100 square feet of floor space per bed. Beds must be so placed that under average conditions the deep breathing of sleeping occupants will not spray secretions from the nose and throat into the air to be inhaled by those in nearby beds. With an allowance of 60 square feet per man there exists 6 feet distance between the heads of the men. Beds should at all times be so arranged that there is head-to-foot sleeping. When necessary, staggering of beds will aid in securing the desired distance between men.

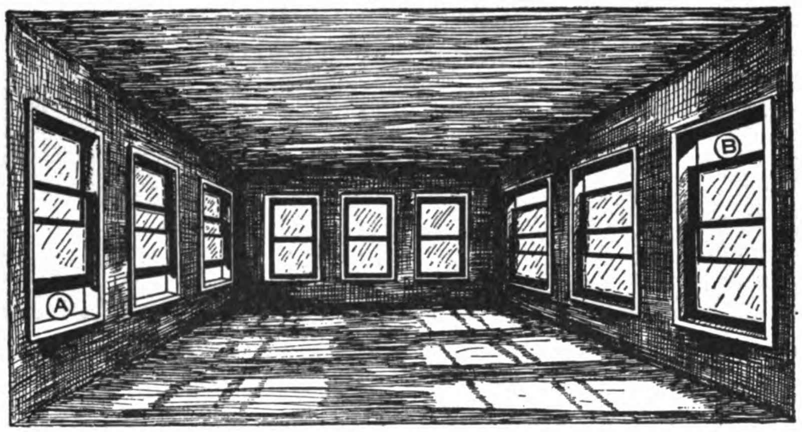

FIGURE 59.—Ventilation of squad rooms, showing method of arranging window openings. *A*—Inlet. *B*—Outlet.

(2) If head-to-foot sleeping and staggering of beds still allow less than 5 feet between the heads of the men, the beds in the squad rooms should be separated by screens to convert each bedspace into a cubicle. The cubicle screen is readily made from an ordinary shelter tent half, blanket, sheet, or boards. The screen made from a shelter half may be fixed on a bed or cot by tent poles. The screen extends 2 to 4 feet above the surface of the head of the bed, the height decreasing toward the foot, and extending 1 foot below the cot or bed. If the screen is too short, too low, or does not extend below the bed, air currents may carry the infectious secretions of an occupant to adjacent occupants. If cubicles are too high or extend too far beneath the bed, they interfere with the movement of the air and cause improper ventilation. Cubicles should be used for all recruits during the

respiratory disease season and for all troops in the presence of or during a threatened epidemic.

d. Proper barracks sanitation means cleanliness. Spitting on the floors, dry sweeping of the floors, careless coughing, sneezing, and the use of common drinking cups and towels must be prohibited. An ample supply of cuspidors containing a 2 percent solution of cresol to a depth of 1 to 2 inches is important. Cuspidors must be cleaned daily. Bedding should be aired twice weekly. Beds should be cleaned with soap and water at frequent intervals.

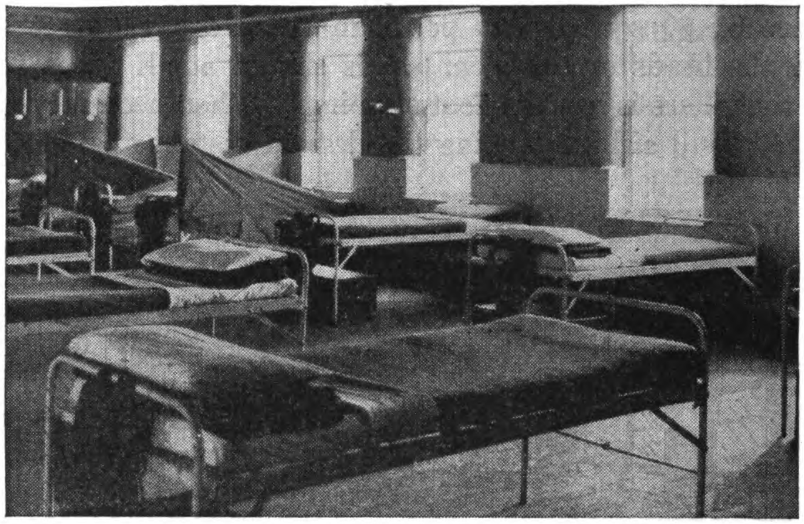

FIGURE 60.—Method of constructing cubicles in squad rooms by the use of shelter tent halves with head-to-foot arrangement of beds.

e. Mess gear and utensils should be thoroughly disinfected. Any food handlers showing evidence of respiratory disease should be promptly relieved from duty.

SECTION IV

PREVENTION AND CONTROL OF INTESTINAL DISEASES

250. General.—*a.* The intestinal diseases are those in which the causal agents are eliminated from the body in the feces and urine. They are usually transmitted by contaminated food and water which

may be transmitted by the hands or by eating utensils. The principal intestinal diseases are—

Amebic dysentery.	Helminthic infestations (worms).
Bacillary dysentery.	Paratyphoid fever.
Cholera.	Protozoal dysenteries.
Diarrhea.	Typhoid fever.
Food infection.	Undulant fever.
Food intoxication.	

b. Carriers of typhoid fever, amebic dysentery, or other of the intestinal diseases are relatively common. This fact must be kept in mind in considering the control of the intestinal disease group.

251. Control measures.—The following measures are essential to the control of intestinal diseases:

a. Purification and protection of water supplies.

b. Inspection and protection of food supplies.

c. Mess sanitation.

d. Waste disposal.

e. Fly control.

f. Immunization (routine only for typhoid fever).

g. Rigid personal hygiene of all individuals.

h. Rigid discipline in matters of sanitation, particularly as regards avoiding unauthorized sources of water and food.

252. Field water supplies.—*a. Requirements.*—Water requirements vary under different conditions. Individuals cannot maintain good health in active field service with less than 1 gallon of water per day for drinking and cooking. Troops on field service and in temporary camps will ordinarily use 2 to 5 gallons of water per person per day for all purposes. In semipermanent camps the per capita consumption varies from 20 to 40 gallons per day. In permanent stations the per capita consumption may vary from 50 gallons to as much as 200 gallons per day. Animals ordinarily require 10 gallons of water per day each, but in combat conditions, may be reduced to 5 gallons each per day.

b. Sources.—All sources of water in the field must be considered as contaminated and all water should be properly treated before use. Some sources of water are, however, better than others. Surface water (ponds, rivers, or small streams) is generally more heavily contaminated than ground water (wells or springs).

c. Responsibility.—(1) The Quartermaster Corps is responsible for the procurement and treatment of water for all stations and camps in time of peace, and in the zone of the interior in war, except

in the case of smaller units, when supply of water by the Quartermaster Corps may be impracticable.

(2) The Corps of Engineers is responsible for all water supplies in a theater of operations except at times, in the case of smaller units, when supply by the Corps of Engineers may be impracticable.

(3) If for any reason the Quartermaster Corps or the Corps of Engineers does not supply treated water, unit commanders are responsible for the procurement and treatment of water supplies. Unit commanders are at all times responsible for the protection and control of the use of water supplies within their organizations.

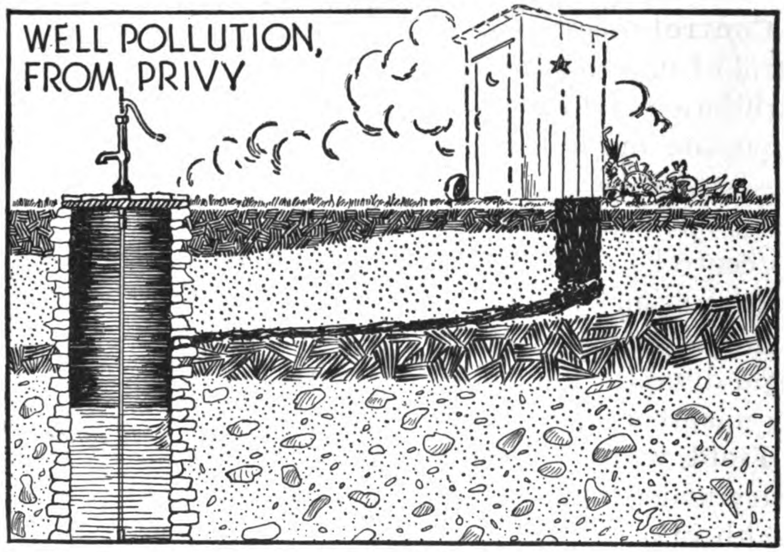

FIGURE 61.—Pollution of well by seepage from pit privy.

(4) The Medical Department is responsible for making recommendations as to the most satisfactory source and method of treatment of water supplies.

d. Protection.—Every source of water supply should be carefully guarded against pollution by human or animal wastes. Pollution can occur either by surface or subsurface drainage. Latrines and kitchen soakage pits should be located so that drainage is away from the water source. If a stream is to be used as the source of the water supply of an organization, it should be marked off in zones, indicated by markers, and water guards should be posted.

e. Purification.—(1) *Preliminary treatment.*—The water selected should be as clean as possible, and the heavier organic matter removed by straining or settling. A pit dug 4 to 5 feet from the edge of a stream or pond and 3 to 4 feet below the stream level makes a satisfactory settling basin. Another method is to remove both

ends from a barrel or oil drum and sink one end into the bottom of a shallow stream or pond, dipping water from inside the barrel.

(2) *Boiling*.—Boiling is the safest method, but is undesirable because of the flat taste and because of the lack of containers for boiling other than small quantities. Five minutes of boiling is required for sterilization of water.

(3) *Chlorination*.—Chlorination is the choice method and may be carried out in the water sterilizing bag (Lister bag), in water carts,

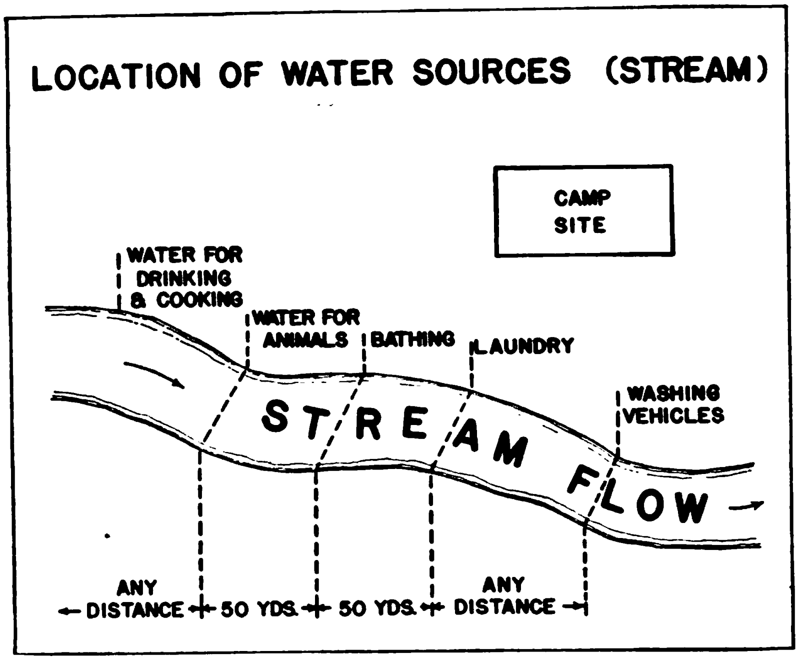

FIGURE 62.—Protection of water supply by proper use of stream from which water is taken for various purposes.

in small reservoirs, or by the purification units operated by the Corps of Engineers. The exact amount of chlorine required will vary with the characteristics of the water being treated. Water containing considerable organic matter requires considerably more chlorine than does clear water.

(*a*) *Water sterilizing bag method*.—The procedure is as follows:

1. Suspend the bag on a tripod. Fill it with water to the mark 4 inches from the top, straining the water through cheesecloth. The capacity is 36 gallons.

2. Draw a small quantity of water through one of the faucets into a canteen cup.

3. Break a tube of calcium hyperchlorite into the canteen cup, stir with a clean stick, then fill the cup two-thirds full of water.

4. Empty this solution into the water bag and stir thoroughly with a clean stick which is long enough to reach to the bottom of the bag.
5. Draw at least one-half canteen cup of water from each of the faucets and pour it back into the water bag. This serves to sterilize the faucets.
6. Wait 30 minutes after chlorination before using the water.
7. When especially trained technical personnel and facilities are available it may be practical to control accurately the degree of chlorination and thus provide a more acceptable water supply when judged from the point of both taste and safety. This controlled chlorination requires the use

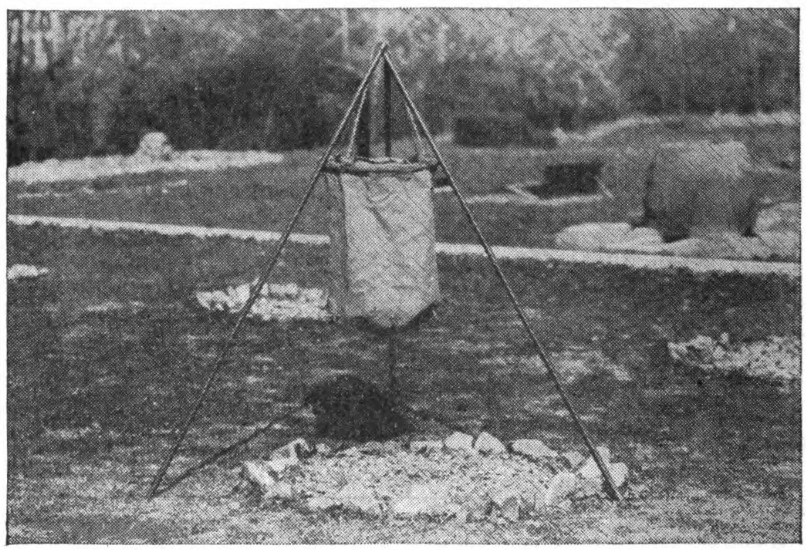

FIGURE 63.—Water sterilizing bag.

of an orthotolidine test solution and may be employed after the calcium hyperchlorite is added to the water in the following manner: Wait 10 minutes, then wash out one of the faucets by allowing a small amount of water to run through onto the ground. Fill a clean canteen cup two-thirds full of water from the same faucet. Add 1 cc. (15 drops) of orthotolidine testing solution to the water in the cup. Wait 5 minutes and note the color produced. Below is a guide for reading the color reaction between the free chlorine and orthotolidine:

(a) *No color.*—Insufficient chlorination. Add more calcium hypochlorite.

(b) *Canary yellow.*—Insufficient chlorination. Add more calcium hypochlorite.

(c) *Deep yellow.*—Satisfactory chlorination. This represents about one part per million (p. p. m.) of chlorine.

(d) *Orange red.*—Overchlorinated. Add more water and retest.

(e) *Bluish green.*—Alkaline or hard water. Add a few more drops of orthotolidine to get a correct color reading.

8. The cover should be kept on the bag to prevent recontamination. The unpleasant taste of chlorine is diminshed by allowing chlorinated water to stand several hours before use. If for any reason orthotolidine testing solution is not available, it can safely be assumed that one tube of calcium hypochlorite will adequately chlorinate 36 gallons of water. It will never dangerously overchlorinate this amount.

(*b*) *Water cart method.*—Chlorination may be done directly in water carts, stirring in calcium hypochlorite at the rate of about one tube to each 36 gallons of water. The exact amount needed can be determined by the orthotolidine test. These carts must be thoroughly cleaned at frequent intervals.

(*c*) *Canteen method.*—Fill a canteen with water and dissolve into it the contents of one tube of calcium hypochlorite, being sure that it is evenly mixed throughout. Add one canteen cap (6 cc.) of this solution to each canteen of water. Wait 30 minutes before drinking the water. This method is less accurate than chlorination in the water sterilizing bag and requires very close supervision of all individuals. The concentrated calcium hypochlorite solution may be prepared in a 1-quart bottle instead of in a canteen.

(4) *Use of iodine.*—In the absence of calcium hypochlorite, tincture of iodine may be used as a temporary expedient. Two drops of tincture of iodine will purify one canteenful of water. Thirty minutes should be allowed before the water is used. This method is rarely practicable in combat since iodine will not, ordinarily, be available for this purpose.

253. Disposal of wastes.—*a. General.*—The disposal of waste materials is essential in the control of communicable diseases, especially those belonging to the intestinal group.

b. Classification.—The wastes which must be disposed of are—

(1) *Human wastes.*—Excreta, solid and liquid, and bath water.

(2) *Kitchen wastes.*—Liquid and solid.

(3) *Animal wastes* (manure).

(4) *Rubbish.*

c. Human.—Human wastes play the most important role in the transmission of intestinal diseases because they are frequently carried from cases or carriers into water which is to be used for drinking, or are conveyed to food by the hands or by insects, rats, and mice. The problem of disposal of human wastes is increased in bivouacs and in temporary or semipermanent camps.

d. Latrines.—The following general guides apply to latrines constructed in camps of those types:

(1) Latrines are company installations, maintained by the personnel of the company concerned.

(2) Latrine seats or space is provided to accommodate 8 percent of the command at one time, each man being allowed 2 lineal feet of latrine space.

(3) Latrines should be flyproofed.

(4) Latrines should not be dug below the ground water level.

(5) Latrines dug in clay are unsatisfactory, since liquids will not soak away into the ground.

(6) Latrines should be placarded when closed, showing the date and the organization.

(7) Latrines should be located at least 100 yards from any mess, and so that drainage into a source of water supply is impossible. The preferable location is about 30 yards from the end of the company street.

(8) A lighted lantern should be hung at each latrine at night unless the military situation demands concealment.

e. Construction and care of latrines.—(1) *General.*—The types of latrines used in temporary and semipermanent camps differ in construction, but their care is similar. The primary objectives in all types of latrines are to control nuisances and to prevent access of flies to human excreta.

(2) *Shallow trench.*—(*a*) Shallow trench (often called straddle trench) latrines are used for the disposal of feces and urine in bivouac, in camps of less than 1 week, and at the noon halt on a march. They may also be used until deep pit latrines can be constructed in camps of longer duration than 1 week. The shallow trench latrine is usually constructed by digging a trench 1 foot wide, 2 feet deep, and 8 to 10 feet long. Sometimes, however, it may be desirable to dig small units of shallow trenches, each 2 to 4 feet long. The earth removed should

be piled at one or both ends of the trench, and be used by each man to cover his excreta. Boards placed along the edges of the trench provide better standing.

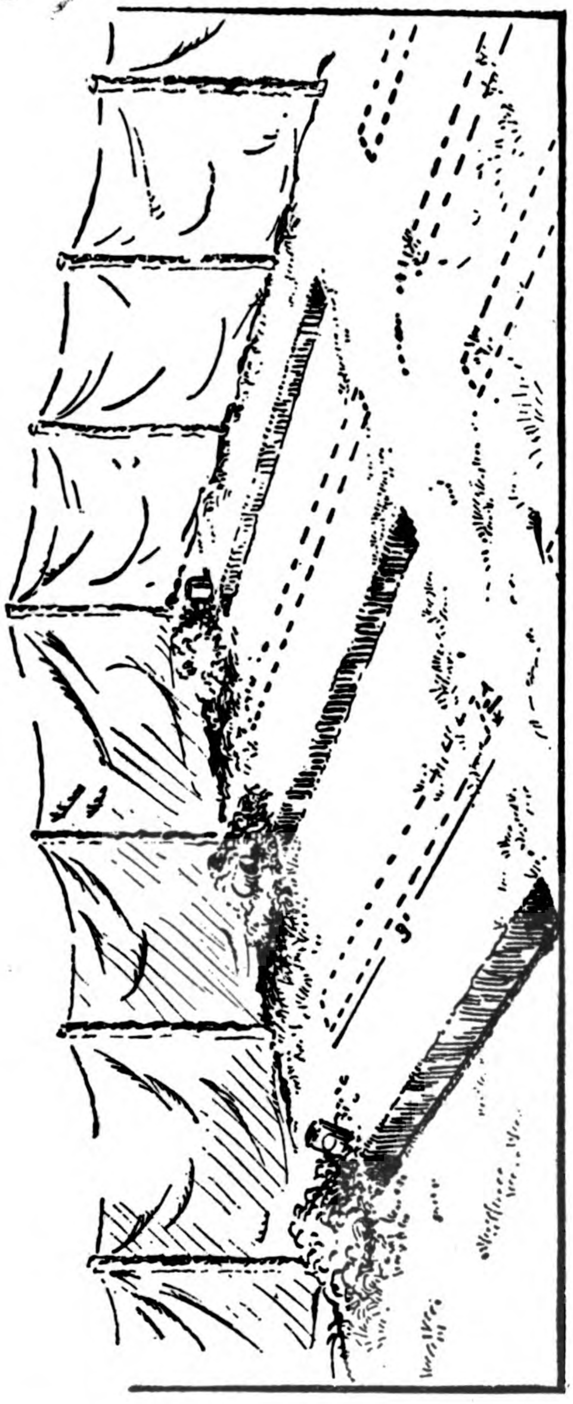

FIGURE 64.—Trench latrine.

(*b*) Shallow trenches should be closed by refilling with earth when the contents have reached within 1 foot of the surface of the ground. The trenches should, if possible, be sprayed with crude oil daily.

(3) *Deep pit.*—(*a*) When troops are in camp 1 week or longer, deep pit latrines and urinal troughs or urine soakage pits are constructed. Deep pit latrines may be used even in camps of rather permanent nature. The deep pit latrine is used together with the standard quartermaster latrine box, and must be dug of exact dimensions to conform to the size of the box.

(*b*) The latrine pit is dug 2 feet wide, 8 feet long, and 4 to 10 feet deep. The depth is dependent on the character of the soil and the length of time the latrine is to be used. A latrine to be in use 1 week is dug 3 feet deep, and 1 foot is added for each additional week the latrine is to be used. For example, if a latrine is to be in use 4 weeks, it should be dug 6 feet deep, and if for 8 weeks, it should be 10 feet

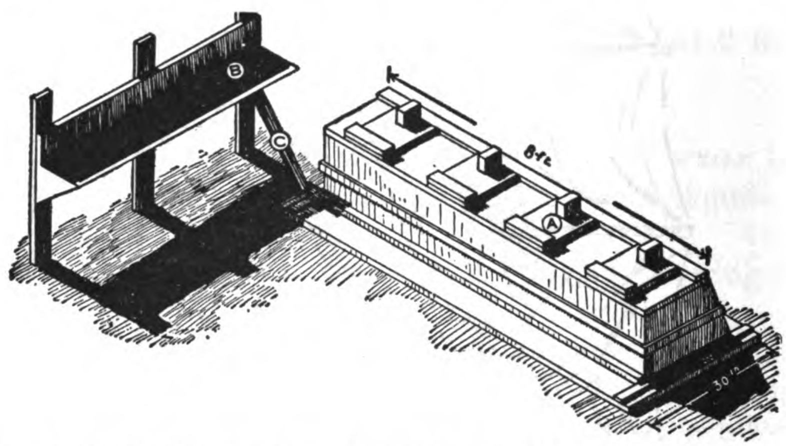

FIGURE 65.—*A*—Standard latrine box. *B*—Trough urinal. *C*—Pipe leading from urine trough into latrine pit.

deep. Striking rock or ground water may limit the possible depth. A company of 100 men requires 16 feet of latrine space (2 standard latrine boxes).

(*c*) Pit latrines must be flyproofed to prevent access of flies to fecal material, and to prevent the escape of larvae in case flies have gotten into the pit and breeding has taken place. Flyproofing is accomplished in the following manner: An area 4 feet wide surrounding the pit is excavated to a depth of 6 inches. This area is then covered with burlap and soaked with crude oil. This burlap hangs down the walls of the pit to a depth of 18 inches and is turned down into the ground at the outer borders of the area. The earth is replaced, tamped down, and more oil added. If burlap is not available, as will often be the case, oil alone may be used, and if oil is not obtainable, the earth may be hardened by moistening with water and tamping. Earth should be tightly packed around the edges of the box to seal all openings to the pit.

(*d*) The latrine may be enclosed by a canvas screen. If this is not available, a brush screen should be used. A large wall tent may be used to enclose a latrine. A drainage ditch, 6 inches deep, should be dug outside the latrine enclosure to carry surface water away from the pit.

(*e*) Latrines must be kept clean and free from odors. Crude oil or a mixture of crude oil with fuel oil or kerosene applied to the interior of pits and boxes is of value in eliminating odors and repelling flies. Crankcase drainings may be used but they are less satisfactory. Lime is of no practical value in latrine pits except as a deodorant. The burning out of latrine pits is not advisable since it does not accomplish incineration of excreta and does interfere with measures taken for making the pit and box flyproof. Special attention must be given

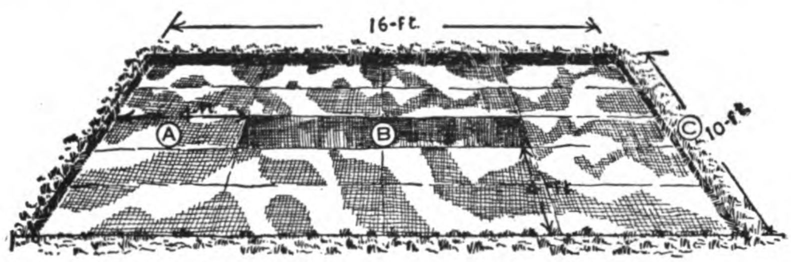

FIGURE 66.—Flyproofing latrine pit. *A*—Oil-soaked burlap extending completely around pit. *B*—Opening of pit. *C*—Sidewall of excavation in which burlap is placed.

to the cleanliness of urine troughs. Constant attention by a latrine orderly is necessary for proper care of latrines. The following points are particularly important:

1. The contents of the pit, the sides of the pit, and the interior of the box should be sprayed with crude oil daily.

2. The seats should be scrubbed daily with soap and water, and twice a week should be scrubbed with a 2 percent cresol solution. They should be dried after cleaning.

3. The urine troughs should be scrubbed daily with soap and water.

4. The seat covers should be kept closed when not in use.

5. The box should be kept flytight by repairing it as necessary.

6. Fly traps should be placed near each latrine.

7. An ample supply of toilet paper should be available.

(*f*) Deep pit latrines should be closed when filled to within 2 feet of the surface. The box should be removed, the pit contents sprayed with crude oil and covered with burlap, and the pit filled with dirt domed 12 to 18 inches above surface. The site should be placarded

with the date of closure and the name of the organization. The same spot should not be used again for at least 1 year.

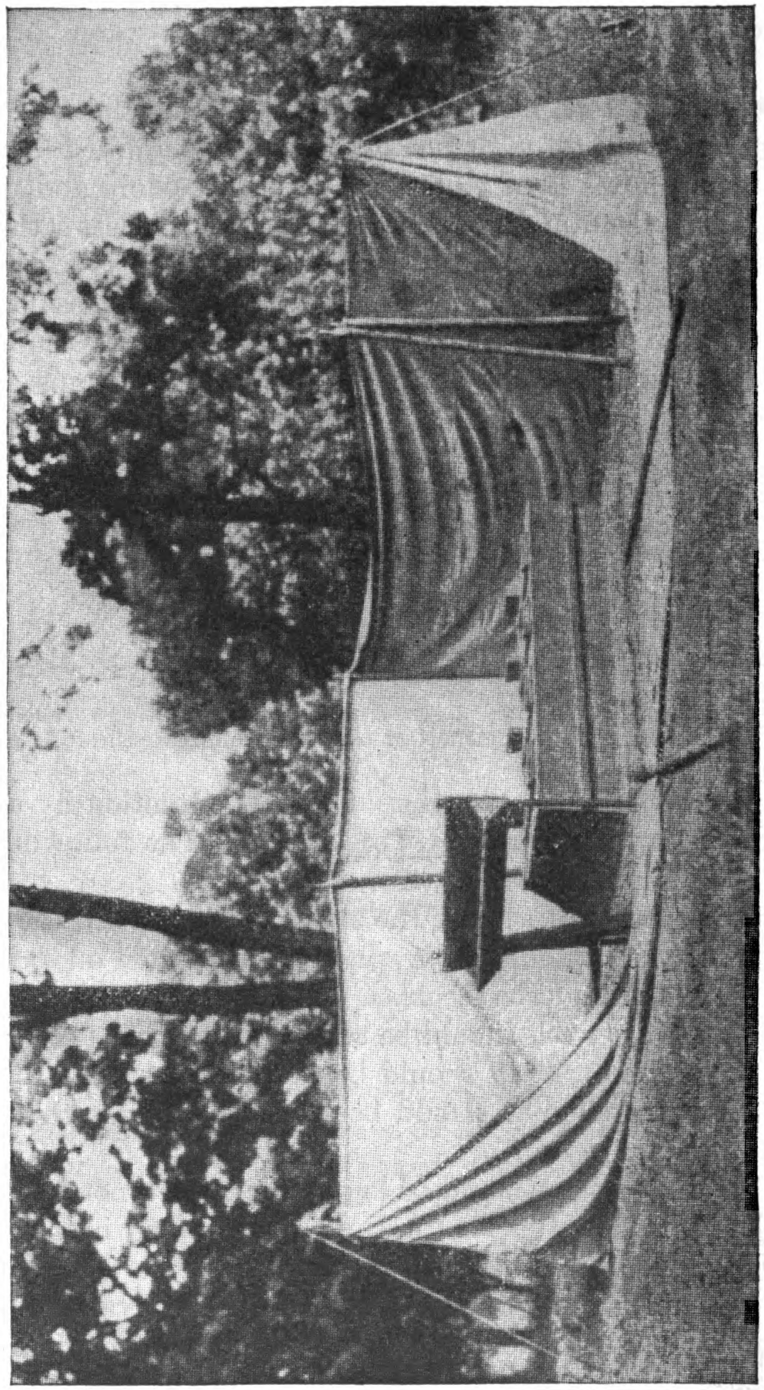

FIGURE 67.—Latrine with screen dropped on one side to show box and urine trough.

(4) *Pail.*—If the character of the soil or any other reason makes it impracticable to dig deep pit latrines, a pail latrine may be substituted. By placing hinged doors on the rear of, and a floor in the standard

latrine box, it may be used for a pail latrine. The pail is placed directly below the seat and, if located in a building, the hinged doors should open directly to the outside. The latrine seats and rear doors should be selfclosing and the box made as nearly flyproof as possible. The floor should be waterproof, concrete if possible, and have sufficient slope to promote rapid and thorough drainage of the wash water. A trough urinal may be installed within the latrine building with a drain pipe leading into a container outside the building. The pails must be removed and emptied daily, being replaced by clean pails, the bottom of which should contain about 1 inch of a 2 percent solution of cresol. The latrine box must be cared for as pit latrines. The disposal of the excreta from pail latrines may be accomplished by burial or incineration. It may be possible at times to empty the pails into a manhole of a nearby sewer.

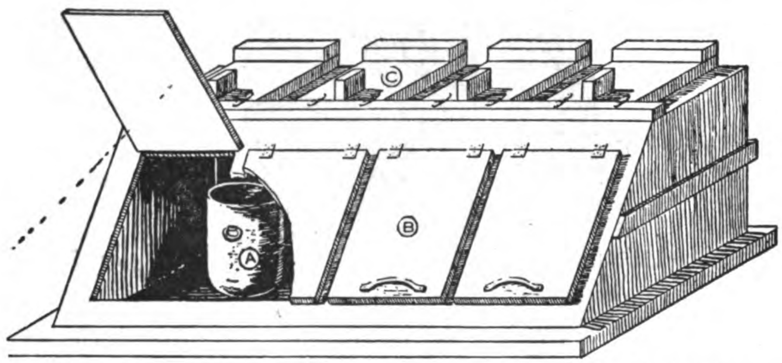

FIGURE 68.—Method of adapting standard latrine box for use as pail latrine. *A*—Latrine pail. *B*—Hinged doors. *C*—Self-closing lids.

f. Urine trough and soakage pit.—(1) *Trough.*—If a deep pit latrine is dug in ground which will absorb liquids well, a urine trough drains into the pit and is included within the latrine enclosure. This trough is constructed from tin, galvanized iron, or wood. If from wood, it should be lined with tar paper. The trough should be U- or V-shaped, and 5 feet in length. It is connected to the pit by short sections of pipe.

(2) *Soakage pit.*—If the latrine pit is in ground having poor absorbing qualities, a urine soakage pit should be used for the disposal of urine. This consists of a pit 4 feet square and 4 feet deep, which is filled with pieces of broken rock, flattened tin cans, brick, or broken bottles. Urinals made of 2-inch pipe are placed at each corner of the pit extending 8 inches below the surface and 30 inches above. A tar-paper funnel containing grass or straw is placed in the upper end of each pipe. Important precautions in the proper opera-

tion of such a soakage pit are changing the grass or straw in the funnels daily, cleaning the funnels daily with soap and water, changing funnels weekly, and keeping the pit surface free from debris, oil, or any substance which might clog it. The soakage pit may receive urine from a trough urinal located within the latrine enclosure, the pit itself being outside the enclosure. Urine pipes or spaces at a urine trough should be provided at the rate of 5 per 100 men. A soakage pit should serve 200 men indefinitely. When it is closed, the pipes should be removed and the pit covered with dirt and sod.

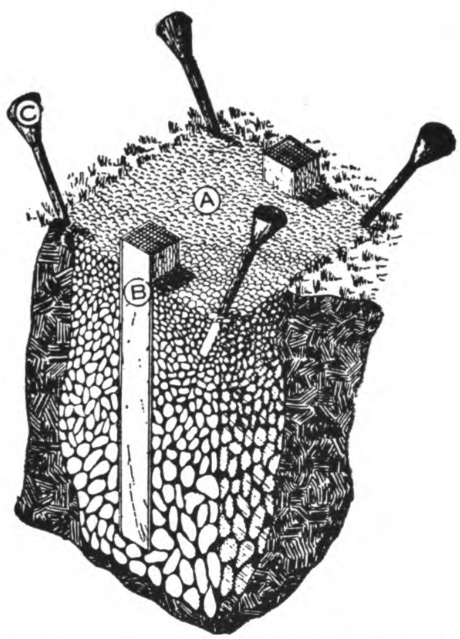

FIGURE 69.—Urine soakage pit. *A*—Rocks filling pit. *B*—Ventilator shafts. *C*—Pipe urinals.

g. Night urinal cans.—If the distance to the latrines is considerable, a large can or pail with 1 inch of 2 percent cresol solution should be placed at the end of each company street at night, for use as a urinal. Each morning the contents of the cans should be poured into the latrines or soakage pits, and the can should then be washed.

h. Animal wastes.—(1) *General.*—Horse manure is an ideal breeding place for flies. Thus, proper disposal of manure is an important feature in field sanitation. The amount of manure to be disposed of averages 10 pounds per animal per day if animals are on a picket line, and 25 pounds if the animals are kept in stables.

(2) *Care of picket lines.*—Picket lines should be thoroughly swept each morning and the manure removed for disposal. The area about the picket lines should be firmly tamped and sprayed with crude oil at least twice a week.

(3) *Methods of disposal.*—(*a*) *Drying.*—In a locality which is consistently dry, manure from picket lines may be scattered and dried in the sunlight. The manure is spread 1 to 2 inches thick and should be raked over daily for from 4 to 7 days. When thoroughly dry, the manure may be removed and either burned or used to fill low areas. An area about 25 feet square is needed to dry the manure produced by 100 animals in 1 day.

(*b*) *Gift, sale, or composting.*—The more commonly used methods of disposal are by sale or gift to civilians, or by composting. If disposal is by sale or gift, care must be taken that the manure is properly collected and transported, and that it is finally disposed of far enough away from the camp that a fly menace will not occur. This method is satisfactory in any type of camp if properly supervised. Disposal by composting is recommended in semipermanent camps. (See par. 254.)

(*c*) *Burning.*—In temporary camps manure may be disposed of by burning, but enormous amounts of wood and oil are required unless the manure is thoroughly dried beforehand. This method is impracticable in a wet climate.

i. Kitchen wastes.—(1) *General.*—Kitchen wastes consist of the food remnants accumulated after meals and in the preparation thereof, as well as the water in which kitchen utensils and mess gear have been washed. The amount of kitchen wastes varies considerably, especially the liquid portion. However, the solids average about ½ pound per person per day and the liquids average 200 to 1,000 gallons per company of 200 men per day. These wastes must be disposed of to prevent giving rise to offensive odors and attracting flies and rats to the mess area. Solid kitchen wastes may be disposed of relatively easily, but the disposal of liquids becomes increasingly difficult as larger quantities of water are used. For camps of short duration, one night to a few days, both liquids and solids may be disposed of by burial, either in deep pits or in trenches about 2 feet deep. At least 1 foot of earth should be refilled over the garbage. The scattering of lime over garbage is of no practical value.

(2) *Garbage.*—Garbage is often disposed of by sale or gift to civilians to be used as food for hogs, and it may be used on military reservations for the same purpose. Its disposal by sale or gift to civilians may lead to unsanitary conditions about a camp through spilling in transfer from garbage cans to other containers, leakage of containers, failure of collection, or unsatisfactory cleaning of cans. When thorough cooperation with the contractor can be maintained so as to insure cleanliness in the procedure, there is no objection to this method of disposal. However, the site of final disposition should be far enough

removed from the camp that odors and flies will not become a nuisance in the camp area. Garbage should not be transferred from one container to another within the camp area. When garbage is to be used as food for swine, it is necessary to separate it into edible and nonedible portions, the latter being disposed of by incineration. Except when it is disposed of by burial, it is necessary that garbage be separated into liquid and solid portions by passing it through a strainer.

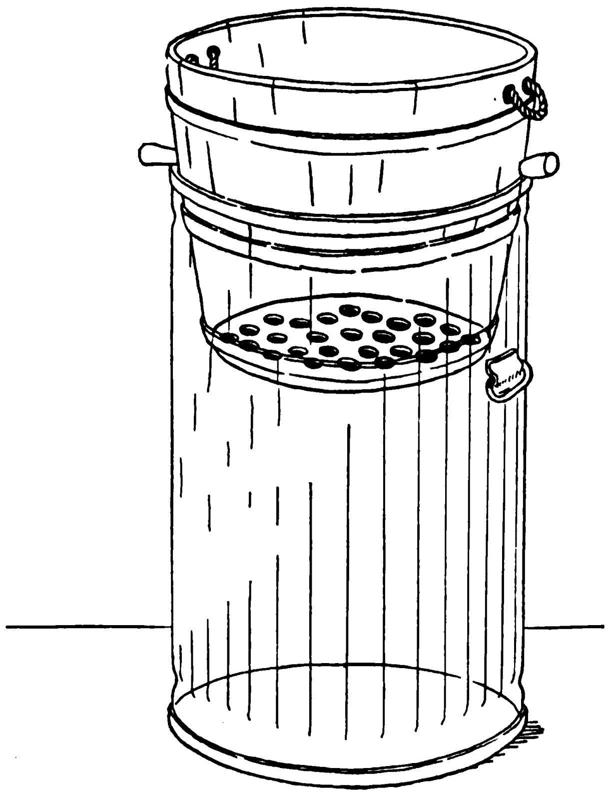

FIGURE 70.—Garbage drainer.

j. Soakage pits and trenches.—(1) *Pits.*—Liquid kitchen wastes in amounts not in excess of 200 gallons per day are best disposed of by a soakage pit similar in construction to a urine soakage pit. A hole 4 feet deep and 4 feet square is filled with broken rock, varying in size from about 3 inches in diameter at the bottom of the pit to 1 inch at the top. Tin cans or broken bottles may be substituted for the broken rock. Ventilating shafts similar to those in the urine soakage pit are advisable but not essential. A grease trap is necessary in conjunction with a soakage pit as grease, if not removed from the liquid waste, will soon clog the soakage pit. Two such pits should be constructed for each kitchen if the camp is to last several weeks. A daily rest period of several hours will increase the efficiency of soakage pits. If two

pits are available, they should be used on alternate days. In camps of long duration each soakage pit should be given a rest period of 1 week every month. If, in spite of these precautions, the pit becomes clogged with organic material, the application of 5 gallons of 10 per-

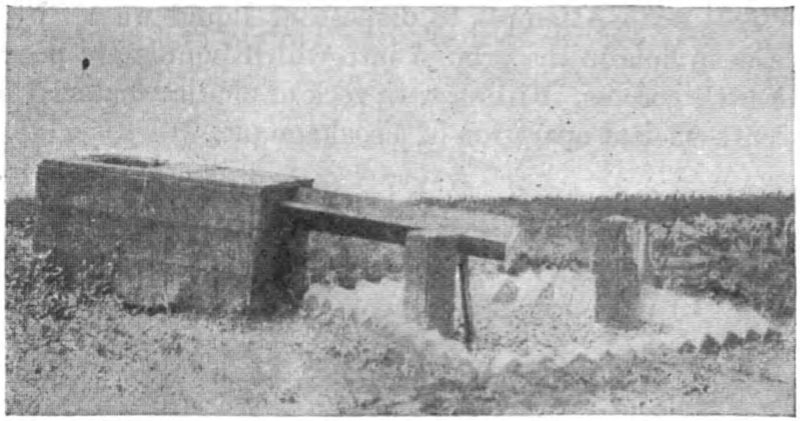

FIGURE 71.—Box grease trap with outlet trough.

cent solution of either calcium hypochlorite or caustic soda may clear it. It is desirable to locate soakage pits near to the kitchen if suitable soil can be found there. If not, they must be located where satisfactory drainage can be secured.

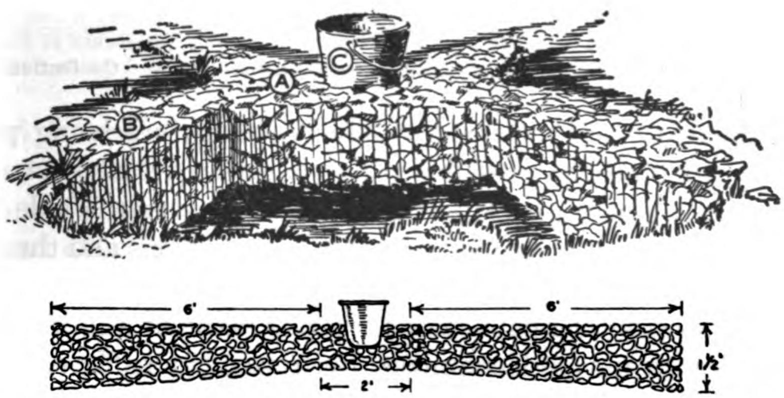

FIGURE 72.—Soakage trench. *A*—Central square area. *B*—Radiating lateral trenches. *C*—Pail grease trap.

(2) *Trenches.*—If the ground water level or a rock stratum is encountered near the surface of the ground, a soakage trench may be substituted for the soakage pit. This trench consists of a central pit 2 feet square and 1 foot deep, from each corner of which a trench radiates outward for a distance of 6 feet. These radiating trenches are 1 foot wide and vary in depth from 1 foot where they leave the central pit to 18 inches at the outer end. The central pit and the radiating trenches

are filled with broken rock. A grease trap must be employed in conjunction with this trench.

(3) *Pit under field range.*—Another optional method is to construct a soakage pit under the firebox of a field range. Liquids are thus disposed of by evaporation as well as by soakage.

(4) *Sullage pit.*—Attempts to dispose of liquid wastes by merely digging a deep hole in the ground into which liquids are poured will meet with little success. Filling with rock or similar material is necessary to secure efficient operation of a soakage pit.

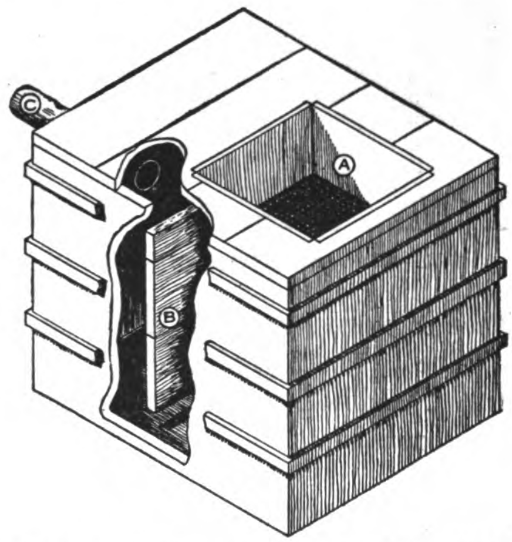

FIGURE 73.—Baffle grease trap. *A*—Strainer. *B*—Baffle. *C*—Outlet.

k. Grease traps.—(1) *General.*—The water before being placed in the soakage pit must be passed through a grease trap to remove food particles and as much grease as possible; otherwise, the side walls of the pit will soon become coated with grease and debris and the leaching of water into the soil is prevented.

(2) *Baffle.*—(*a*) The baffle grease trap is made of a half barrel or a box divided into unequal chambers by a wooden baffle extending to within 1 inch of the bottom, the larger chamber, two-thirds of the barrel, being the influent and the smaller, the effluent chamber. The trap is provided with a hinged removable lid. A metal strainer 8 inches square and 6 inches deep, the bottom of which contains many perforations and which is filled with straw to prevent the coarser solids from entering the trap is inserted into the lid of the influent chamber. The strainer is made removable to facilitate cleaning. A 1-inch pipe is inserted in the upper third of the effluent chamber leading to a V-shaped trough which carries the effluent to the soakage pit. In oper-

ating the trap, both chambers are filled with cool water. When the warm liquid waste meets the cool water in the influent chamber, the grease congeals and rises to the surface and is prevented by the baffle board from reaching the outlet to the soakage pit.

(*b*) Careful attention is necessary in order to prevent such a trap from becoming a nuisance. The trap should be drained daily, the sediment removed and burned, and the trap including the removable strainer thoroughly cleaned with soap and water.

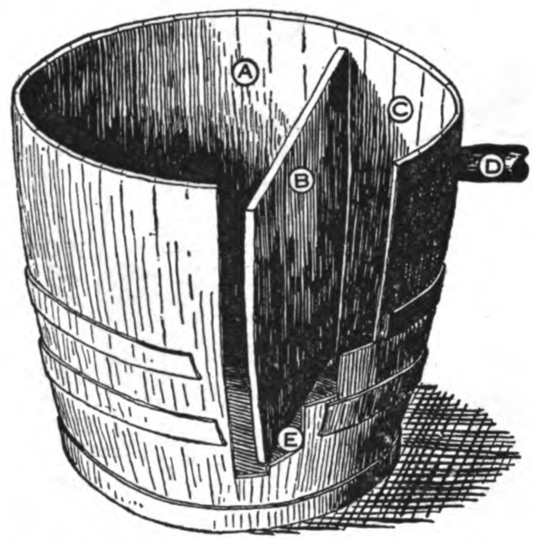

FIGURE 74.—Baffle grease trap made of a half barrel. *A*—Influent chamber into which greasy fluid is emptied. *B*—Baffle. *C*—Effluent chamber. *D*—Outlet pipe. *E*—Space under baffle leading from influent chamber to effluent chamber.

(3) *Ash barrel.*—An ash barrel grease trap is prepared by taking a barrel of 30- to 50-gallon capacity and boring thirty 1-inch holes in the bottom. Place about 8 inches of gravel or small stones in the bottom, and over this place 16 inches of wood ashes. Fasten a piece of burlap over the open end of the barrel as a strainer. This trap may be placed either directly on a soakage pit or on a platform with a drainage pipe or trough to the pit. It is necessary to empty this type of grease trap, wash or throw away the ashes and refill with ashes at least every 2 days. The burlap covering should be washed or renewed each day. This type of trap is generally less satisfactory than a baffle grease trap.

(4) *Pail.*—An old metal pail or can with perforations in the bottom and filled with hay, grass, straw, or an old blanket will remove food particles and part of the grease from liquid wastes. However, much of the grease will pass through. This type of trap should be used only while waiting for a better grease trap to be constructed.

l. Incinerators.—(1) *General.*—In bivouacs solid wastes are generally disposed of by burial in shallow trenches. These trenches should be dug 1 foot wide and 2 feet deep. In temporary camps solid wastes are best disposed of by incineration by individual companies. In semipermanent camps common incineration for several or all units may be desirable.

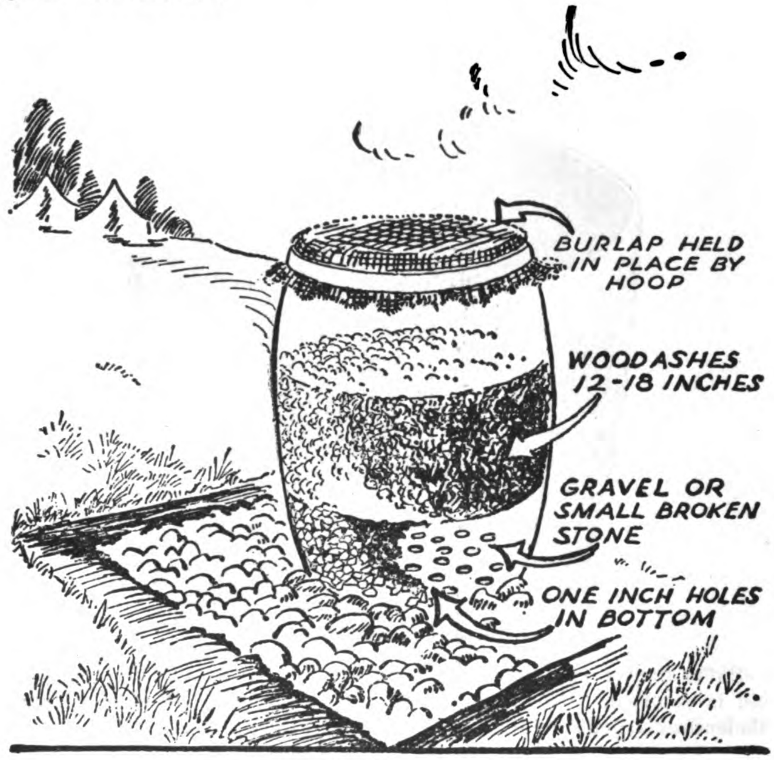

FIGURE 75.—Ash barrel grease trap.

(2) *Cross trench.*—(*a*) The cross trench incinerator is the most satisfactory company incinerator. It is constructed by digging two trenches, each 8 feet long, 1 foot wide, and 1 foot deep, crossing at their centers. A grate of pieces of scrap iron is constructed over the intersection of the two trenches. Over the grate is erected a stack which may be constructed in many ways. The simplest stack is an old galvanized iron can, the bottom of which has been removed. Such an incinerator is satisfactory for camps of less than a month duration. Cross trench incinerators work better when three of the trenches are closed off, leaving the one open toward the direction from which the wind is blowing. Properly fitted pieces of tin may be used to temporarily block off the trenches. The incinerator should be stoked from the top only, the rubbish, flattened cans, and wood mixed with the drained garbage acting as fuel. It is also necessary to keep the burning mass loosened. The fire is built on the grate.

(*b*) A more efficient incinerator may be constructed on the same principle but using stone or bricks instead of the galvanized can and plastering puddled mud or clay on the outside.

(*c*) A still better incinerator stack may be built by setting a wooden barrel, both ends of which have been removed, over the grate and covering the outside of the barrel with several inches of puddled

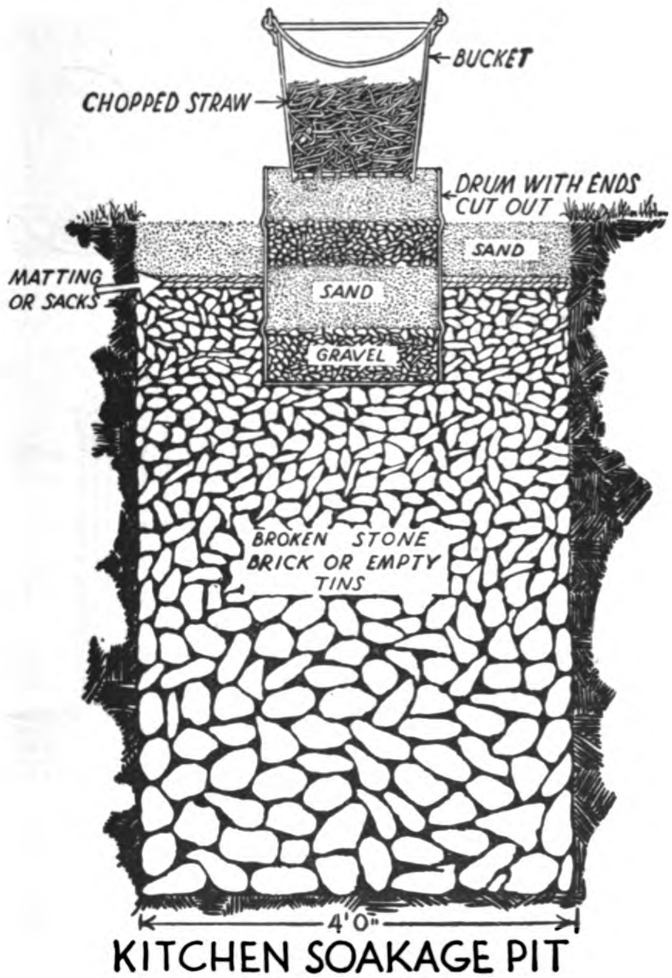

FIGURE 76.—Pail grease trap.

clay. A slow fire is kept under the barrel for several hours to bake the clay. Then a brisk fire is built to burn out the barrel and the incinerator is ready for use. Carefully built, such an incinerator will last for several weeks.

(3) *Rock pit.*—The simple rock pit incinerator is very inefficient and extravagant of fuel. Its use is never advisable.

(4) *Inclined plane.*—(*a*) The inclined plane incinerator is the most efficient of the smaller improvised incinerators for use in semiperma-

nent camps. Its capacity is suitable either for a company or for a battalion. In such an incinerator the garbage is fed into the upper end of an incline and is gradually pushed down to the lower end, drying and burning as it progresses, final combustion taking place on a grate at the lower end. The incline is closed over so as to retain the

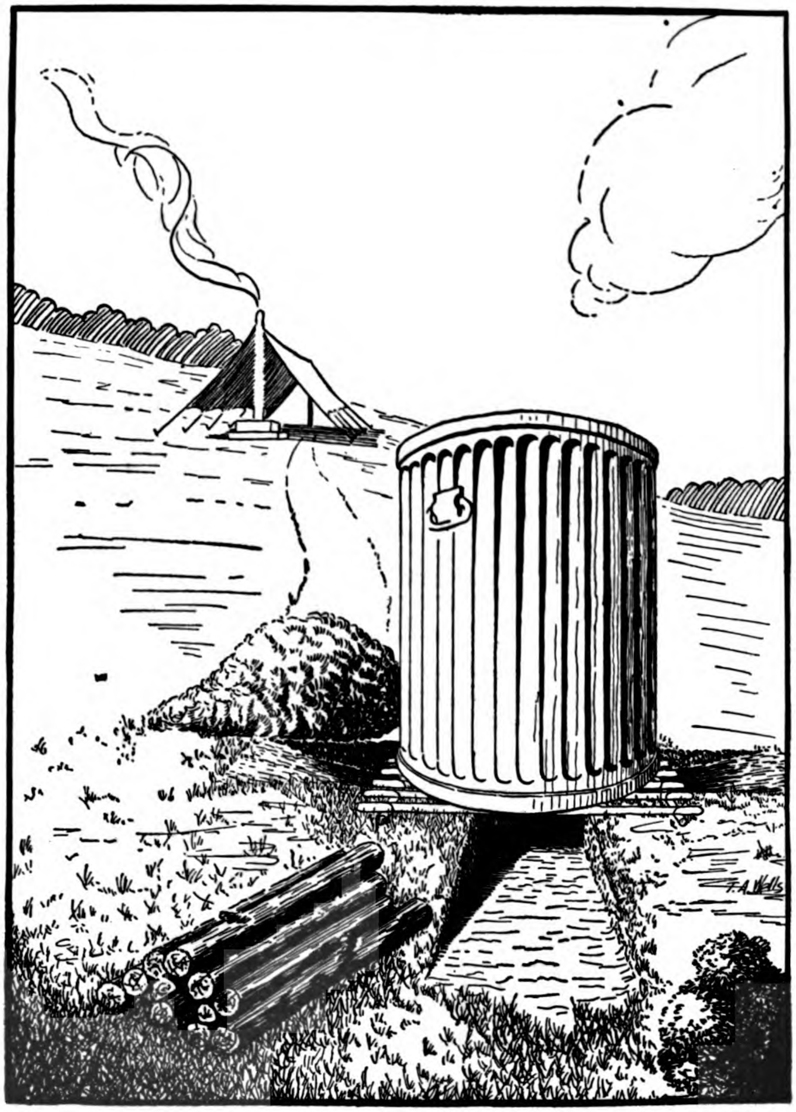

FIGURE 77.—Cross trench incinerator with stack made from galvanized iron garbage can the bottom of which has been removed.

heat and direct it onto the mass of drying garbage. In the incinerator shown, the incline is made of corrugated iron resting upon a rock bed, and the incline is covered over with portions of steel oil drums. There is a loading and stoking area at the rear and a grate area at the front. The stoking area is closed over with a hinged iron cover, a vent 5 by

16 inches for draft being left at the outlet of the incline, and the grate covered with a door which may be opened as desired for draft.

(*b*) The walls of the incinerator may be laid up with stone, brick, or concrete. Sections of two oil drums are used to form the cover, the

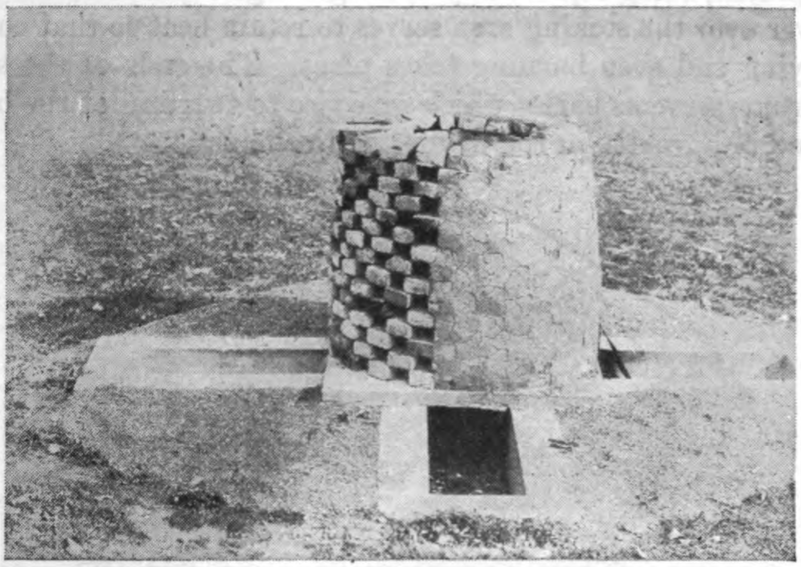

FIGURE 78.—Barrel and trench incinerator.

FIGURE 79.—Barrel and trench incinerator with the barrel made of packed clay molded over a wooden barrel.

drums being cut longitudinally 4 inches above the center and the smaller sections used, the ends being left in place. These sections are placed end to end, supported on the side walls 8 inches above the inclined floor. Puddled clay to a depth of 2 inches is placed over the top of the drums.

(c) In use, a fire of wood and rubbish is built on the grate, and, after the incinerator has become hot, a canful of drained garbage is emptied onto the stoking area, some being pushed part way down the incline. As the garbage dries on the incline it is pushed farther down until it burns, being replaced by other garbage from the stoking area. The cover over the stoking area serves to retain heat so that considerable drying and even burning takes place. The ends of the sections of oil drums serve as baffles which give rise to swirling of the burning gases and aid greatly in the drying and combustion.

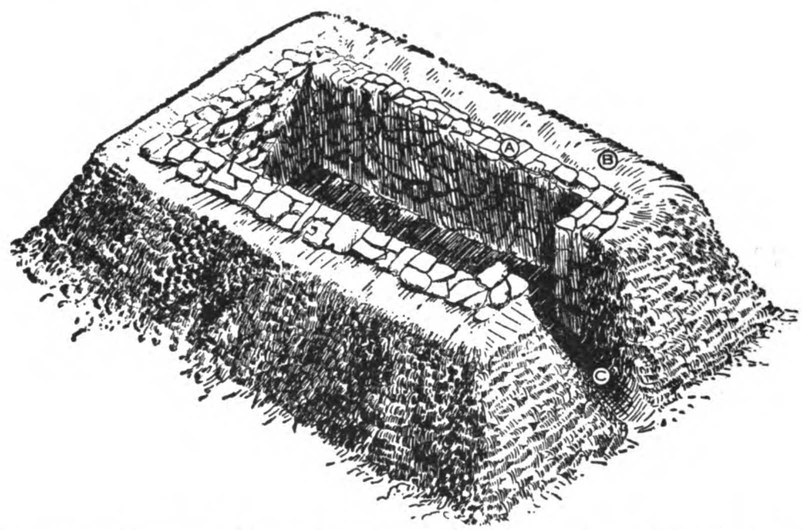

FIGURE 80.—Rock pit incinerator (schematic). *A*—Rock wall. *B*—Earthen embankment to support rock walls. *C*—Open end to permit draft.

(5) *Rock pile.*—The rock pile incinerator may be employed for the disposal of the garbage of organizations up to the size of an infantry regiment. It is very extravagant of fuel but is relatively simple of construction. It consists of a circular pit in the center of which is a cone to divert the air currents upward and thus create a draft. The wall, bottom, and cone are made of loose rock. The pit is about 16 feet in diameter and 24 to 30 inches in depth. The floor and walls should be 12 to 18 inches thick. The draft may be improved by installing draft holes at the junction of the wall and bottom of the pit. The fire is built about the base of the cone. Garbage is placed between the fire and the side wall and, after partial drying, is gradually pushed onto the fire. This incinerator requires on the average about 1 cord of wood to burn 2 tons of garbage.

m. Tin cans.—Tin cans or similar nonflammable kitchen wastes should be burned out thoroughly in incinerators, pounded flat, and then disposed of either by burial or on a dump.

n. Rubbish.—Accumulations of rubbish attract flies and rats, which in turn act as the transmitting agents of certain diseases to which man is susceptible. All rubbish, not garbage, should be collected daily in containers such as gunny sacks which are placed on poles at both ends of the company street and in latrines. It should then be trans-

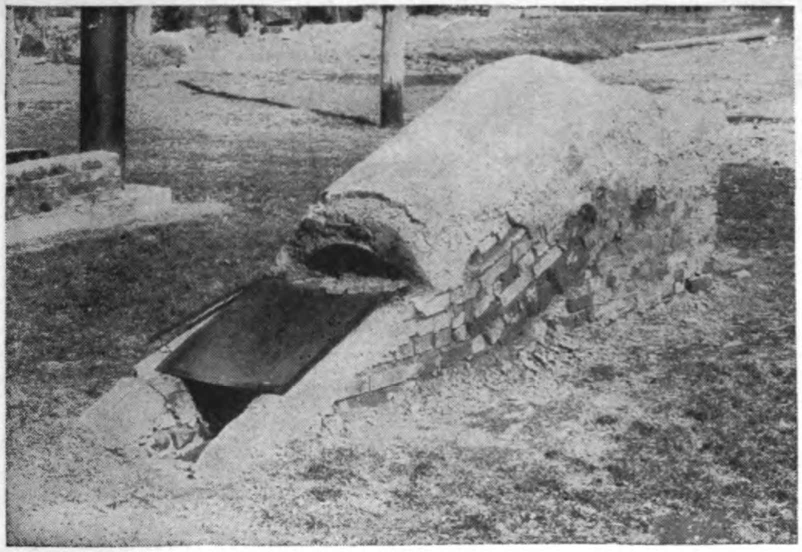

FIGURE 81.—Inclined plane incinerator.

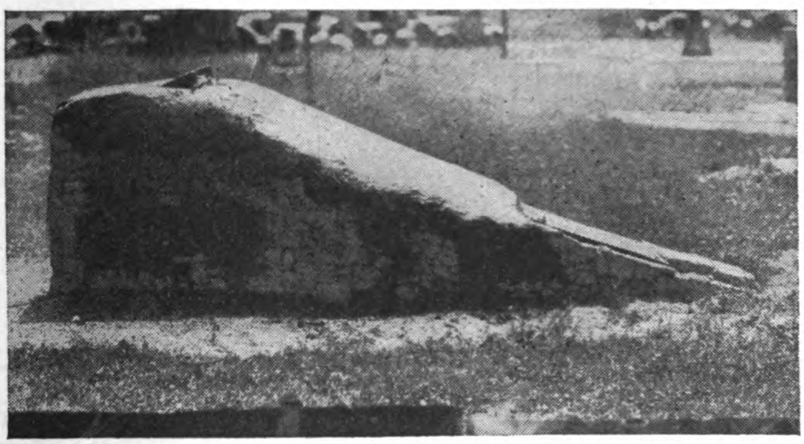

FIGURE 82.—Inclined plane incinerator, side view.

ferred to company incinerators and burned. In semipermanent camps it may be disposed of on a dump, being burned there daily. Care should be taken that no unflattened tin cans or boxes remain on the dump to permit accumulation of water with the resulting possibility of mosquito breeding. Dumps should preferably be located several hundred yards from the tents occupied by troops.

254. Fly control.—*a. General.*—(1) *Importance.*—Flies, especially the ordinary housefly, frequently transmit intestinal diseases. This transmission is accomplished in a mechanical manner. If the fly has access to human excreta it collects small amounts of excreta on its

FIGURE 83.—Rock pile incinerator.

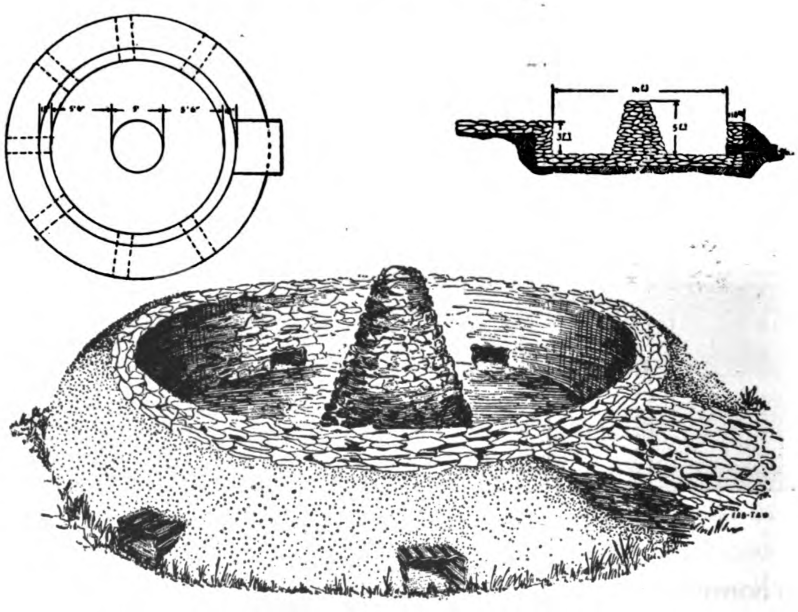

FIGURE 84.—Rock pile incinerator showing draft holes at junction of wall and bottom of pit.

legs and body and in its digestive tract. If it later has access to food or eating utensils, some of the excreta is deposited on the food by defecation, regurgitation, and contact of food with the legs and body of the fly.

(2) *Development.*—In its development the fly passes through four stages—the egg, larva, pupa, and adult.

(3) *Characteristics.*—The characteristics of the fly which are important in its control include—

(*a*) Their breeding places of choice, which are horse manure, human excreta, and fermenting vegetable wastes.

(*b*) The necessity of moisture, warmth, and soluble food for the development of the larvae.

(*c*) The fact that temperatures of 115° F. or above will kill the eggs and larvae.

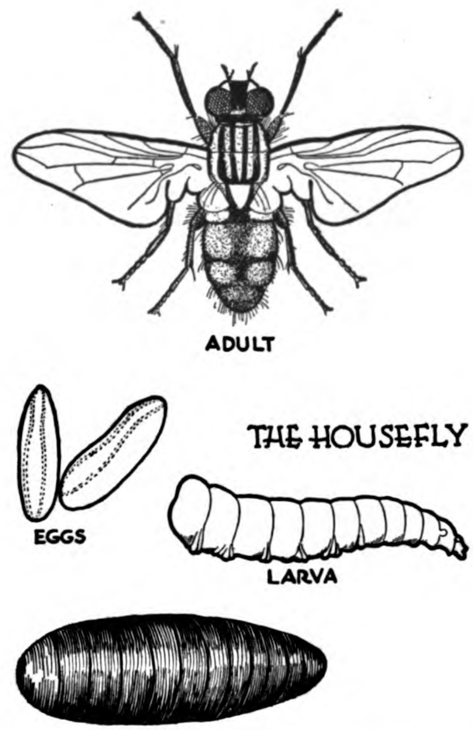

FIGURE 85.—Housefly; stages in development.

(*d*) The tendency of the larvae to migrate from the breeding material prior to pupation.

(*e*) The ability of the larva and adult to crawl through loose manure or earth.

(*f*) The attraction of adult flies to food by odor.

(*g*) Their tendency to go toward light.

(*h*) Their tendency to rest on vertical surfaces and hanging objects.

(*i*) Best temperature for breeding is 80° to 95° F.

(*j*) The range of flight is 200 to 1,000 yards.

(*k*) The number is greatest in the late summer and early fall.

(*l*) Continuous breeding may occur during the winter in heated buildings.

b. Control.—(1) *Breeding places.*—The control of breeding places is essentially the problem of the proper disposal of horse manure, human excreta, and garbage. The disposal of horse manure in temporary camps is considered in par. 253*h*. Disposal in semipermanent camps may be accomplished by *composting*, which is the close packing of manure on a platform. In properly composted manure a temperature of 140° to 160° F. is reached at a depth of 1 foot below the surface;

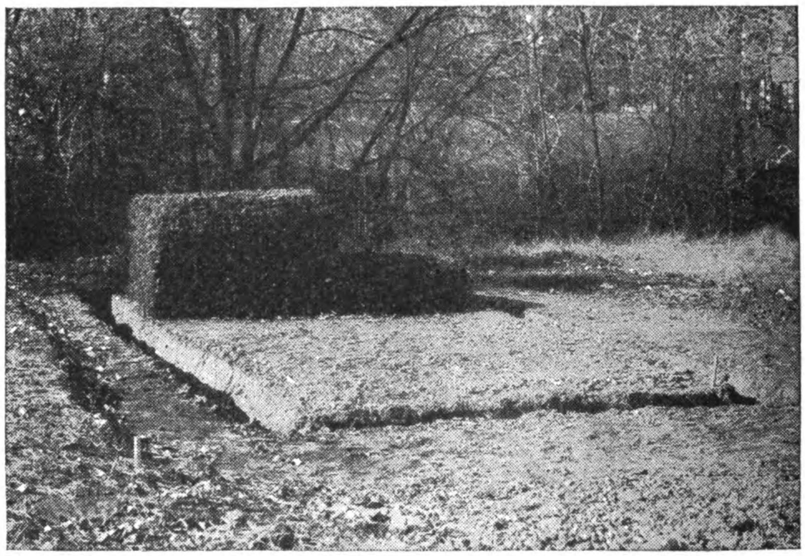

FIGURE 86.—Manure compost pile with ditches for the control of migrating larvae.

such a temperature will quickly kill the fly egg and larva. By the use of larvicides the fly larvae on the surface can be destroyed. The compost pile should be located over 1,000 yards from the camp and where it will not be an unsightly nuisance. A compost platform is constructed by leveling off an area of ground 50 feet long and 20 feet wide and digging a trench around the area 12 inches wide and 12 inches deep with vertical sides. The manure is placed on the platform as follows: Beginning at one corner, place the manure on an area 3½ feet long and 10 feet wide, piling it to a height of 4 to 5 feet, packing it down very tightly, and dressing the sides neatly. The sides must at all times be kept vertical. The second day's supply of manure is placed on the adjacent corner in a similar manner. On the third day the supply of manure is placed immediately adjacent to the first pile and on the fourth day, adjacent to the second pile, and on the fifth day the supply is piled on top of the first pile. The manure is thus placed on the platform in the succeeding small

sections as shown in figure 86. This is done for the purpose of confining the fly breeding to the smallest possible area. The manure should be kept moist so as to promote decomposition. The sides of the pile should be sprayed daily with a mixture of cresol, kerosene, and fuel oil. Crude oil or a light road oil is used in the trench, the earth in the trench being kept visibly moist with oil. In the preparation of the platform all vegetation should be removed for a distance of 2 feet from the edges and the earth here tamped down firmly and oiled thoroughly; similarly, the earth beyond the trench should be freed from vegetation, packed down, and oiled. The trenches are to be kept clean at all times. A platform this size should care for the manure of 100 animals for 2 months.

(2) *Larvicides.*—Larvicides are used chiefly in connection with compost piles and latrines. The following larvicides are effective in destroying fly larvae and are listed in order of efficiency:

(*a*)	Cresol	2 parts.
	Kerosene	20 parts.
	Fuel oil	78 parts.
(*b*)	Cresol	2 parts.
	Soap suds	98 parts.

(*c*) Waste motor oil.
(*d*) Crude oil.

The above larvicides have the disadvantage that they render the compost somewhat unsatisfactory as fertilizer. The following larvicide, while not rapid in action, is very efficient and has the added advantage that it does not render the compost unsatisfactory for fertilizer:

Commercial sodium arsenite	4 pounds.
Molasses	2 quarts.
Water	50 gallons.

(3) *Destruction of adult flies.*—(*a*) *Swatting.*—Swatting is one of the essential methods of destruction of flies which have entered a screened building. It is, however, labor-consuming.

(*b*) *Traps.*

1. General.—Fly traps are the most valuable means for destruction of adult flies in camps. Many types are used but all consisting of two main parts—the bait chamber and the trap chamber. The former is the lower and darker part into which the flies are attracted by the odor of the bait. The upper and lighter part is the trap chamber and is connected with the bait chamber

by a small opening through which the flies crawl toward the light after having fed on the bait. The construction of fly traps is simple.

2. Square.—A square fly trap such as shown is made 12 to 18 inches square and 18 to 24 inches high. The corner uprights and connecting lateral strips are made of boards 1 inch thick and 1½ inches wide. The framework is covered with No. 14 mesh wire screening tacked to the corners and connecting strips. The lid is a

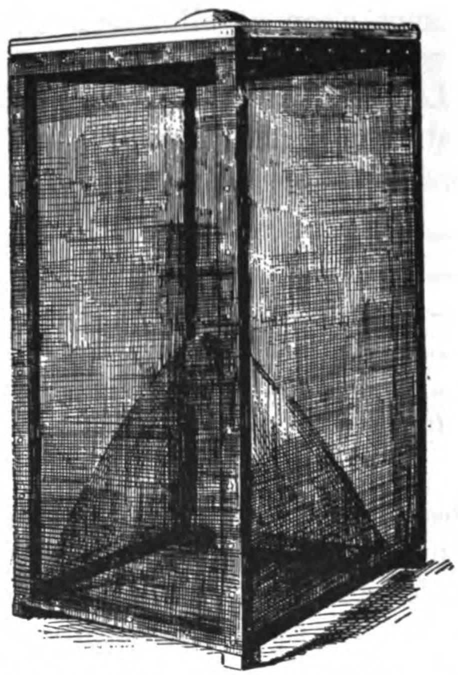

FIGURE 87.—Square fly trap with removable top and pyramidal bait chamber.

screen frame which fits down over the top. The bait chamber is inside the trap and is made of screening tacked to the edges of the lower lateral strips and terminating in an apex 10 to 14 inches above the bottom of the trap. At the apex is a ¼-inch hole through which the flies enter the upper chamber. The corner uprights extend 1 inch below the lower edge of the trap to form the supports for the trap.

3. Box.—A box fly trap is made essentially as above except the sides are made of wood. It is constructed as follows: Make a closely fitting top for an ordinary packing box 12 by 18 by 11 inches, and cover with screen. Cut a 6- to 8-inch hole in the bottom of the box, over which

a wire cone about 10 inches high with a ¼-inch hole at the top is tacked. The corners are raised from the ground by 1-inch blocks.

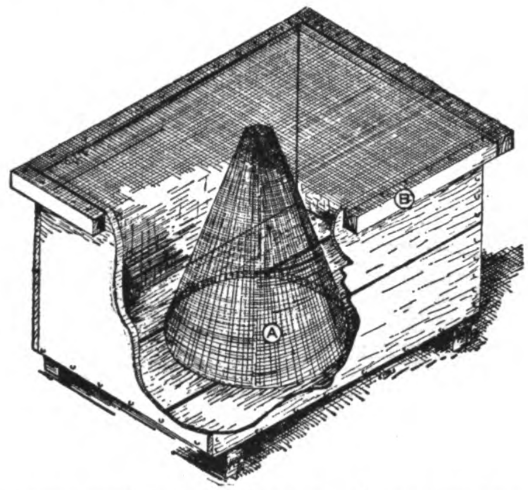

FIGURE 88.—Fly trap constructed of packing box. Corner cut away to show method of installing cone.

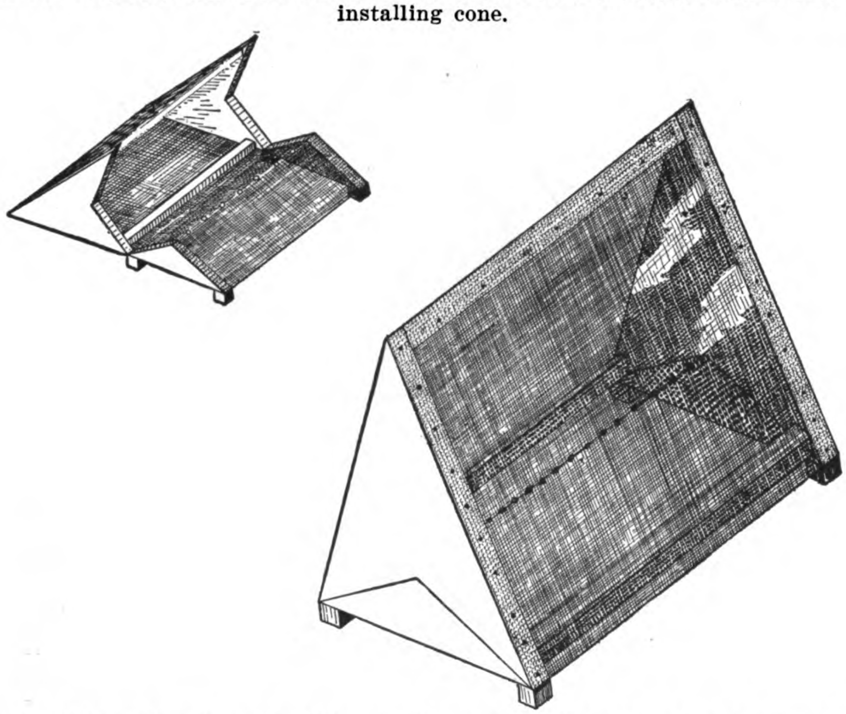

FIGURE 89.—Triangular fly trap with cone-shaped bait chamber. Single opening at apex of cone leading into trap chamber. The small tin disk covers an opening through which flies may be removed from the trap chamber.

4. *Triangular.*—A triangular fly trap such as shown in figure 89 is the most satisfactory for use in camps because of its simple and durable construction, but it is less efficient than the square trap. It should be about 18 inches

long and 12 inches high. A hole 1 to 2 inches in diameter, covered by a tin flap, is cut in one end of the trap for the removal of dead flies.

5. *Pail.*—A trap may be constructed from an old 3- to 5-gallon metal bucket. The bottom of the bucket is cut out except for 1 inch around its outer border, to which a wire cone is soldered. A top is made which fits down into the bucket a distance of 1 inch and is screened

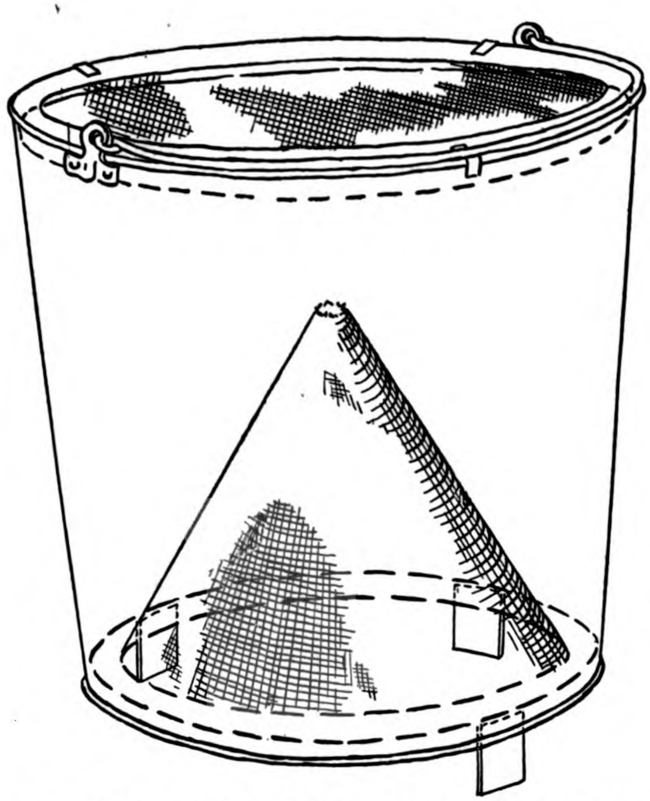

FIGURE 90.—Fly trap, showing method of construction, using ordinary metal bucket.

except for 1 inch of metal around the outer border. The top is held in place by three pieces of copper soldered to the outer side of the bucket so that they may be bent over the cover. The bucket is supported by three pieces of metal 1 inch high.

6. *Baits.*

(a) A satisfactory bait must have an odor attractive to flies, and in turn not be offensive in appearance or odor to people in the vicinity. Fermented baits are generally very satisfactory. The best fermented bait is—

Cornmeal	1 pound.
Molasses	½ pint.
Water	1 quart.
Yeast	¼ ounce.

Mix the water and molasses and heat to boiling. Stir in the cornmeal and allow the mixture to cool. Then add the yeast and allow to stand in a warm place 1 or 2 days. It is then ready to use.

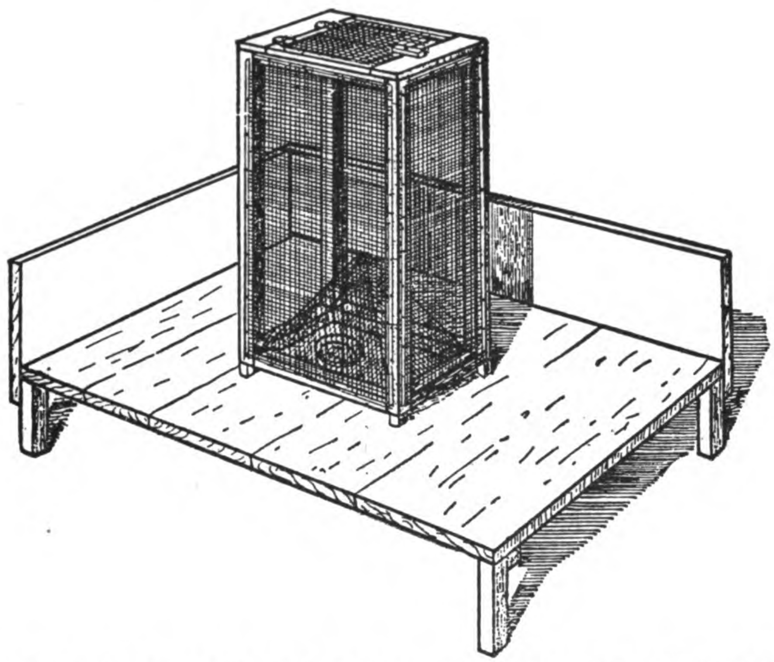

FIGURE 91.—Square fly trap with board windshield to protect trap from wind.

(b) Other fermented baits are two parts molasses and one part vinegar, crushed over-ripe bananas in milk, brown sugar, and sour milk.

(c) Decaying meat or fish are efficient baits but may result in offensive odors.

7. *Location.*—Traps in sufficient number should be located near manure piles, latrines, in vicinity of kitchens, mess halls, dumps, and other buildings or areas where flies congregate. They are more efficient if placed in groups of two or three. Traps should be protected from the wind, and this may be done by utilizing a fly trap stand provided with a windshield. Also, traps may be placed behind objects such as buildings, boxes, and garbage cans which protect them from the wind. If placed on

a stand the trap should be at least 12 inches away from the sides of stand so as not to exclude the light from any side of the trap. Traps placed in dark corners or under shade are practically useless.

8. *Care.*—Liquid fly bait should be placed in wide, shallow containers with at least 2 inches between the edges of the bait pan and the edges of the trap. The baits should be inspected daily, the containers kept filled to the desired level, cleaned and refilled whenever a scum forms or sediment accumulates, and should be kept free from dirt and dust. The traps should be emptied whenever a sufficient number of flies accumulate to interfere with the admission of light to the trap chamber. The captured flies may be killed by immersing the trap in soap suds. Practically constant attention is necessary if fly traps are to be effective in the control of flies. Necessary care includes not only cleaning and replenishing bait but also moving the traps about to conform to changes in wind and sunlight.

255. Mess sanitation.—*a. General.*—The company mess is a very potent factor in the transmission of intestinal diseases, and to a lesser degree, of respiratory diseases. Furthermore, the character of the mess has decided influence on the morale, physical fitness, and natural resistance of the individual. The basic consideration of mess sanitation is cleanliness: The essential features in proper mess sanitation are inspection and supervision of food handlers; inspection, protection from dirt and flies, storage, and preparation of food; cleansing and protecting from dirt and flies of mess gear and kitchen utensils; control of flies; and exclusion from the vicinity of the mess of any factors which might result in the contamination of food.

b. Food handlers.—(1) *Personnel.*—The personnel of a mess consists of both permanent food handlers and temporary kitchen police. The dividing line is not a sharp one, but as a working basis, mess sergeants, cooks, butchers, bakers, and mess orderlies assigned for duty in excess of 3 days should be considered permanent food handlers.

(2) *Examination.*—Army Regulations require that such permanent food handlers be examined by a medical officer before beginning duty in the mess, and each 6 months thereafter. The purpose of the examination is to detect cases or carriers of communicable diseases. Those individuals found to be free from communicable diseases will be so certified to the company commander by the examining medical

officer. These certificates should be posted in a conspicuous place in the mess.

(3) *Daily observation.*—Temporary kitchen police are not routinely required to have food handler examinations. However, it is vitally important that both the temporary kitchen police and the permanent food handlers be closely observed at all times for evidence of communicable diseases. This is a responsibility of the mess officer and mess sergeant. Any food handler, temporary or permanent, showing evidence of an illness, particularly of a cold or other respiratory disease, or of diarrhea or other intestinal disease, should be promptly relieved from duty.

(4) *Cleanliness.*—It is equally important that all mess personnel wear clean clothing and have clean hands at all times. The fingernails should be cut short. The hands should be washed immediately after visiting the latrine. Convenient facilities for washing the hands must be provided. In addition to washing the hands in soap and water, rinsing in a 2 percent solution of cresol is a valuable precaution.

c. Food inspection.—All food should be inspected for freshness and quality when received at the mess and, if stored, again while in storage and before being prepared for consumption.

d. Food storage.—(1) *General.*—Food supplies should be protected from insects such as flies and roaches, from dust and dirt, and from rats and mice. Perishable foods should be stored at a temperature that will inhibit the growth of molds and disease organisms. Refrigeration at a temperature of 55° F. or less is desirable for meat and dairy products and for some vegetables and fruits. An important point in the storage of foods, particularly meat, is to avoid packing or hanging so closely that ventilation is impaired. Various devices may be improvised for the storage of food in temporary and semipermanent camps.

(2) *In temporary camps.*—(*a*) In temporary camps food may be stored in watertight containers and immersed in springs or streams, care being taken to prevent contamination. Food may be buried below the surface of the ground where the temperature is lower, lining a pit with burlap and placing boards on the bottom.

(*b*) A suspended food contained consists of a screened box that permits free circulation of air but prevents contamination by insects. The cooling effect may be increased by wrapping the box in burlap which is kept damp. Fresh meat, bottled milk, and vegetables may be temporarily stored in such a container. It should not be used where there is much dust in the air.

(*c*) The underground ice box or cooling box is a simple device consisting of a double-walled box. It is constructed by placing a packing box within a larger one, sunk into a pit in the ground so that the outer lid is slightly above the surface of the ground. A space 3 to 6 inches wide, filled with sawdust, grass, hay, or straw, separates the outer walls and the two bottoms. Two lids are necessary, one for the inner and one for the outer box. A drainage ditch should be dug around the box and a drain pipe should lead through the bottom of the box to a small soakage pit below. A box 4 feet long,

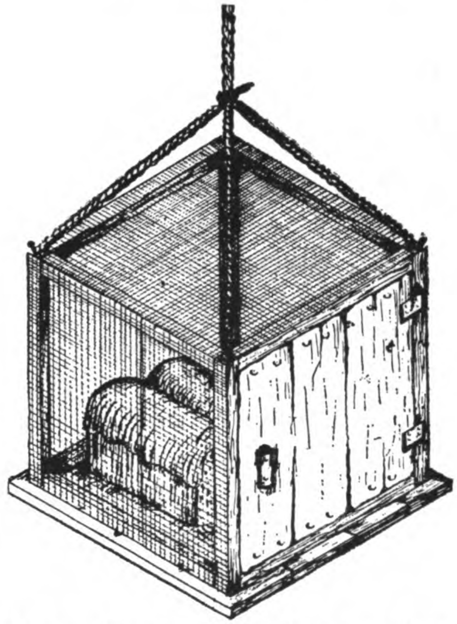

FIGURE 92.—Suspended food container.

3 feet wide, and 3 feet deep, inside measurements, has sufficient capacity for the average company mess. If ice is available, an ice compartment should be constructed at the end containing the drain pipe. Also the box may be used above ground as an ice box. The cooling effect is increased by dampening the packing material between the walls or wetting down the earth around the box. To facilitate cleaning, the inner box should be easily removable. Meat, milk, vegetables, or other perishable foods may be stored in such an ice or cooling box.

(*d*) Bread boxes or storage cabinets should be well ventilated but screened to prevent access of flies to the food.

e. Food preparation.—(1) Thorough cooking and immediate serving after cooking are the best safeguards against the transmission of communicable diseases by food, provided care is taken not to contaminate the food after cooking.

(2) Disease-producing organisms will multiply rapidly in many cooked foods even when placed in the ordinary ice box. This is particularly true in the case of meat hash, sausage, fresh pork, veal,

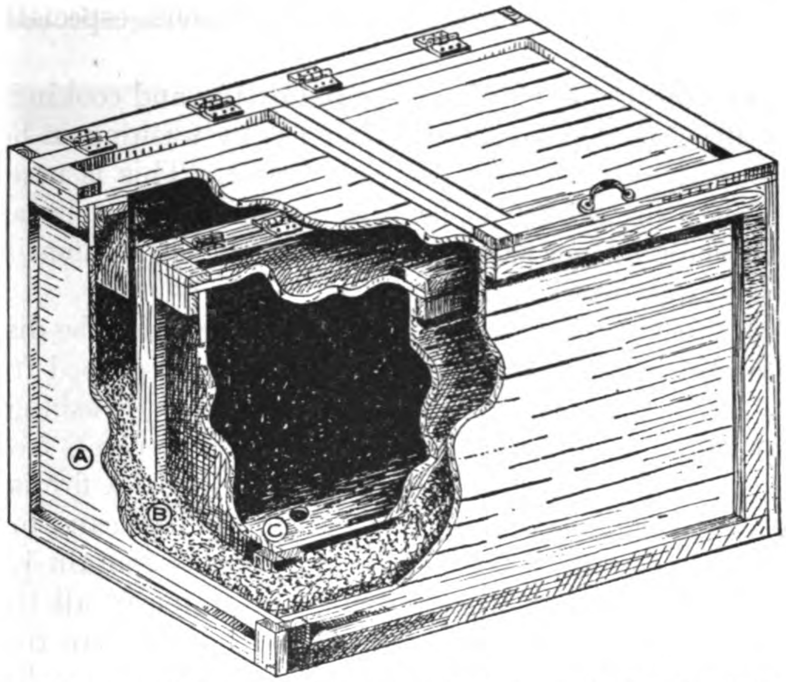

FIGURE 93.—Underground ice or cooling box. *A*—Outer wall. *B*—Insulating material. *C*—Inner wall.

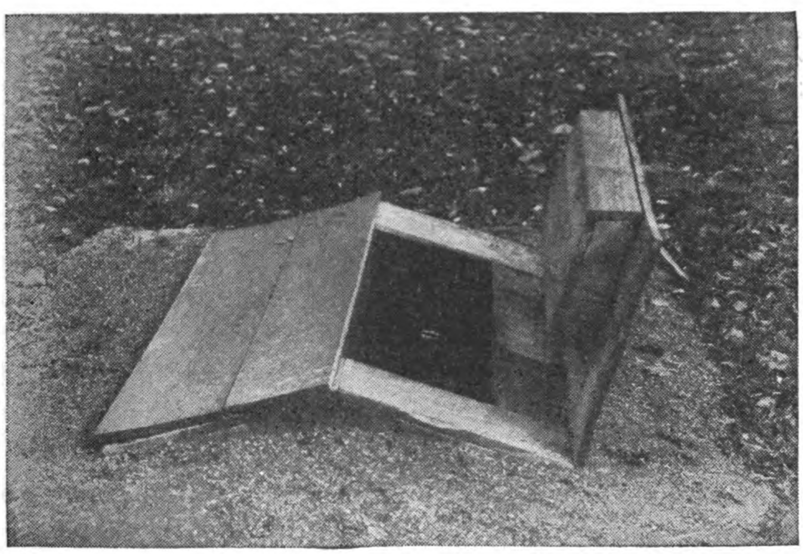

FIGURE 94.—Underground food box.

meat broths or soups, or dishes containing a preponderance of these materials. These foods should not be served as leftovers without adequate reheating.

(3) All vegetables that are to be eaten raw, and which cannot be peeled, should be thoroughly washed in running water before serving. This applies particularly to leafy vegetables such as lettuce, greens, and radishes which may have become contaminated with disease-producing organisms from materials used as fertilizers, especially in the Tropics.

f. Care of utensils.—(1) *General.*—All eating and cooking utensils should be disinfected immediately after use by washing in hot soapy water, followed by rinsing in hot clear water. This is necessary to destroy disease organisms. The utensils should then be air-dried. Dish towels should never be used. When not in use all utensils should be protected from dust and flies.

(2) *Mess kits.*—(*a*) If mess kits are used, they must be disinfected by each individual. Fragments of food should be scraped from mess kits into a can or pit in the ground before washing. Washing of mess kits is usually done in galvanized iron cans. A trench 8 feet long, 1 foot wide, and 1 foot deep is dug near the kitchen. A fire is built in this trench. Over it are placed three galvanized iron cans, preferably supported by strips of metal. Two of the cans contain hot soapy water, and the third hot clear water. The water in all three cans should be kept close to boiling while in use. Each man thoroughly washes his mess equipment in each of the two cans of hot soapy water, then rinses it in the hot clear water, and permits it to air-dry. The cans must be emptied of water and thoroughly cleansed after each meal. The food particles are disposed of by burial or incineration. The water is disposed of in the soakage pit or trench.

(*b*) In semipermanent camps a different apparatus for washing mess kits may be used. It consists essentially of a fire trench with a stack at one end, built over a soakage pit. The pit is 11 feet long, 4 feet deep, and 2 feet wide and is filled to within 1 foot of the surface with varying size stone. Along the two sides and one end a wall of stone, brick, or concrete is built extending 2 feet above the ground level, forming a firebox. The water containers are made from 50-gallon oil drums cut along the longitudinal axis, 4 inches above the center line. Drums with bungs should be used and so cut that the bungs will be dependent when placed on the fire. Pieces of iron pipe of sufficient length are threaded at one end to fit the bung holes and drilled at the other end to receive an iron rod used to turn them in or out. After the drums are placed on the firebox the space between the drums and walls, between the ends of the drums, and between the rear drum and the stack should be filled with clay. This device will require a relatively small amount of fuel

to boil the water. The draft will be such that it will be found desirable to place a damper in the stack. The men can wash their mess equipment without being bothered by flames and smoke. When the washing is completed, the iron pipes are removed and the water escapes into the soakage pit.

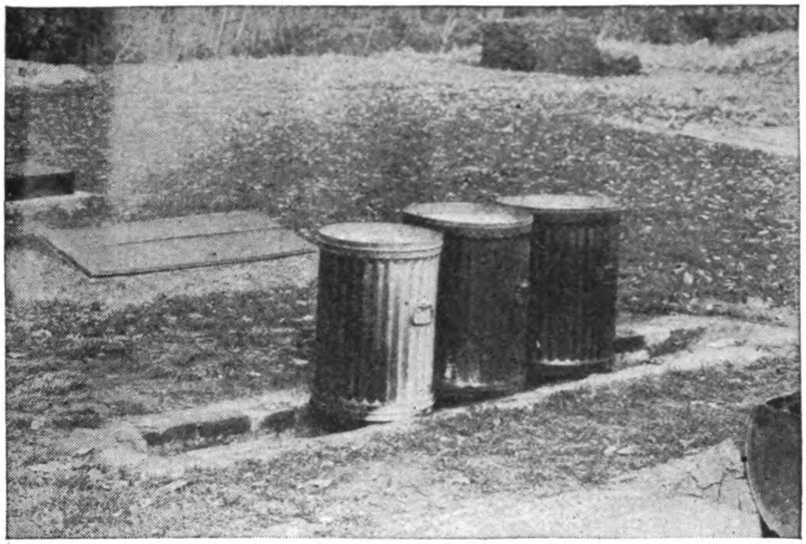

FIGURE 95.—Fire trench and cans for washing mess kits.

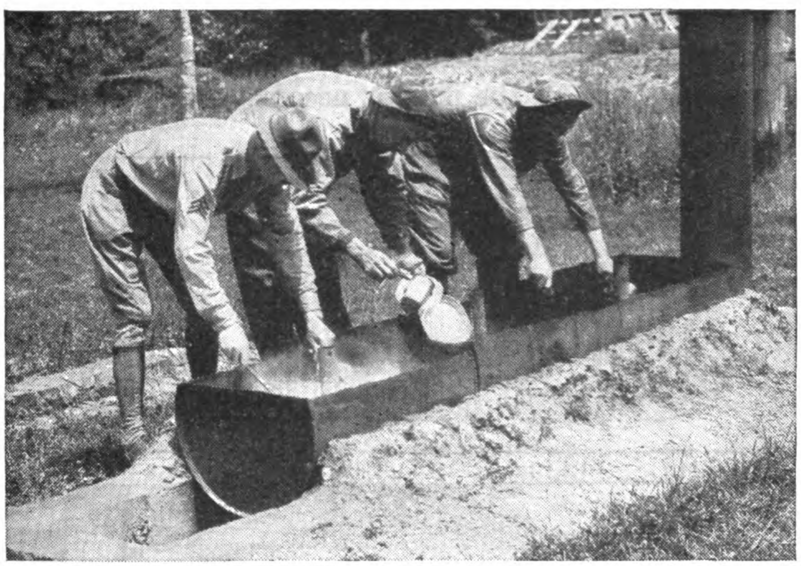

FIGURE 96.—Washing mess kits.

g. Mess tables.—Where tables are available, they should be so constructed that the middle leaf or board can be removed to permit cleaning the space between the boards, and removal of food particles. Tables should be scrubbed with soap and water after each meal.

h. Fly control.—If the mess is housed in a screened building, the screening must be kept in repair. Screen doors should be kept closed when not in use. Flies gaining entrance into the mess hall should be destroyed by the use of traps, flypaper, and sprays, and by swatting.

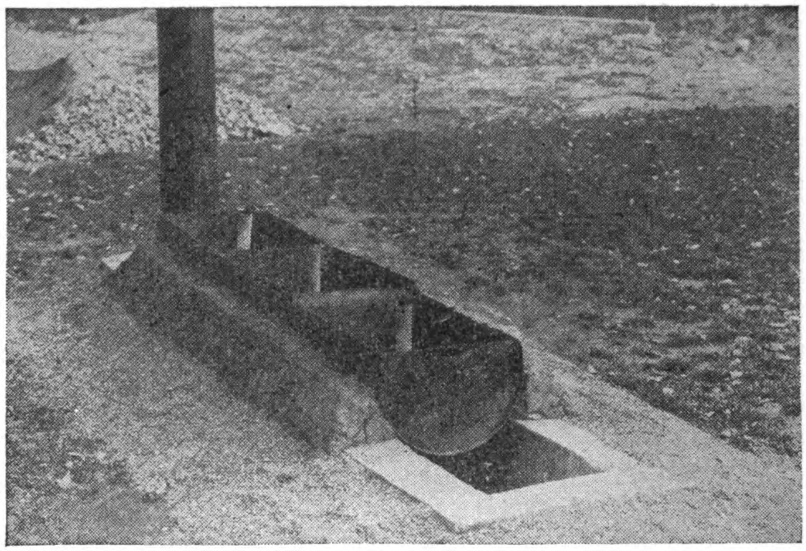

FIGURE 97.—Device for washing mess kits in the field.

i. Disposal of garbage.—All garbage and liquid wastes should be promptly disposed of so as not to attract flies to the vicinity of the mess. Constant police of the mess is necessary to prevent accumula-

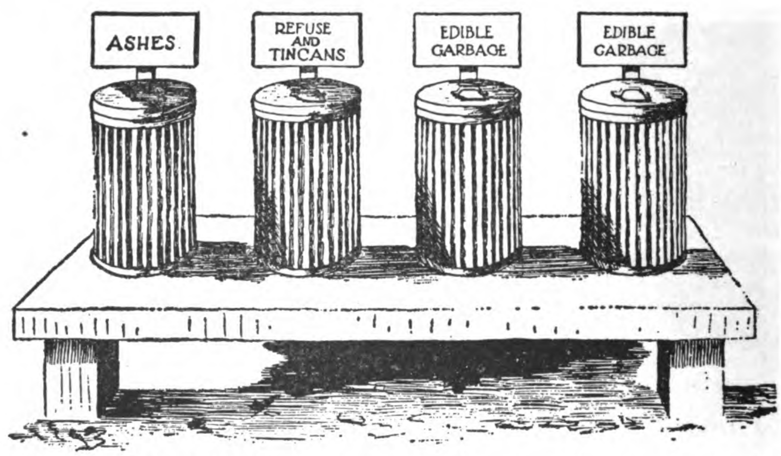

FIGURE 98.—One method of labeling garbage cans for the collection of classified garbage. Concrete garbage stand.

tion of fragments of food. Where practicable, all garbage should be collected, as produced, in garbage cans equipped with well-fitted lids. These cans should be kept outside the mess, either on a garbage

stand or on firm, well-tamped soil. Garbage stands, if used, should not be screened, as this increases the difficulty of keeping them clean and serves to attract flies. Garbage should be removed from garbage cans for incineration or burial at least twice daily, and preferably after each meal. This is done by personnel of the mess unless garbage is being hauled away for disposal outside the company area. The garbage cans should be scoured with hot soapy water and lye at least once each day.

SECTION V

PREVENTION AND CONTROL OF INSECT-BORNE DISEASES

256. Insect-borne disease.—*a. Definition.*—A disease is classified as insect-borne when a bloodsucking insect is the only agent, or the usual one, by which the causal organisms are transmitted from person to person or from animal to man.

b. Tabulation of vectors.—The following tabulation of insect-borne diseases with their vectors includes those diseases of particular interest to the Army:

Disease	*Principal vector*
Malaria	*Anopheles* mosquito (several species).
Yellow fever	*Aedes egypti* mosquito.
Dengue	*Aedes egypti* and *Acdes albopictus* mosquitoes.
Tularemia	Flies, ticks, lice, and fleas. (Also contact with infected material.)
Rocky Mountain spotted fever	Tick.
Relapsing fever	Lice and ticks.
Typhus fever (epidemic)	Body louse.
Typhus fever (endemic)	Fleas (usually).
Trench fever	Body louse.
Bubonic plague	Rat flea.
Filariasis	Several varieties of mosquitoes and biting flies.

c. Transmission.—Transmission of insect-borne diseases is accomplished by the vector's first sucking blood from an infected person or animal and later biting a susceptible individual.

257. Mosquito control.—*a. General.*—Mosquitoes are of importance to health, not only as transmitting agents of disease but also as sources of discomfort. Among the diseases known to be transmitted by mosquitoes are malaria, dengue, yellow fever, and filariasis. The most important of these from a military viewpoint at this time is malaria.

b. Life cycle.—There are four stages in the life cycle of the mosquito—the egg, larva, pupa, and adult. The first three stages are passed in water, while the adult is a free-flying insect.

c. Breeding places.—Mosquitoes may breed in practically any collection of water which persists longer than 10 days. Most types prefer slow-moving streams, ponds, swamps, drains, water receptacles, and roof gutters. Various species differ in their preferences for types of breeding places. Some prefer breeding in and around habitations and are termed domestic. Some prefer to breed in sunlit places, while others prefer shady places. Some prefer fresh water, and others water containing organic material. Detailed discussion of these characteristics may be found in FM 8-40.

d. Range of flight.—Some mosquitoes, including the *Anopheles*, can fly at least 1 mile and with a favorable wind possibly several times that distance.

e. Control measures.—(1) *Elimination of breeding places.*—Measures designed to eliminate breeding places are applicable only in semipermanent and permanent camps. They are highly effective when possible of execution.

(*a*) *Filling.*—Filling is effective and is practical for small depressions where streams overflow or storm water collects. Earth, rocks, garbage, cinders, ashes, rubbish, and old manure may be used as a fill.

(*b*) *Drainage.*—Drainage is applicable in the case of small ponds of water or swamps. It may be accomplished either by surface or by subsurface drainage. Surface drainage can be accomplished by open U-shaped ditches. These ditches may be lined with tile or cement. Unless lined, attention is required to keep out vegetation. Subsurface drainage can be accomplished either by a trench filled with small rocks or by a line of loosely joined tile just under the surface of the ground.

(*c*) *Stream training.*—Stream training is effective but requires considerable labor. The stream edges should be straightened, potholes removed, and grass and underbrush removed for a distance of 4 feet from the edge of the stream. If time, labor, and material permit, stone or cement walls may be constructed to retain the stream.

(*d*) *Emptying water containers.*—All water containers should be emptied weekly. Frequent inspections should also be made for collections of water in tin cans, flower pots, old automobile tires, or gutters.

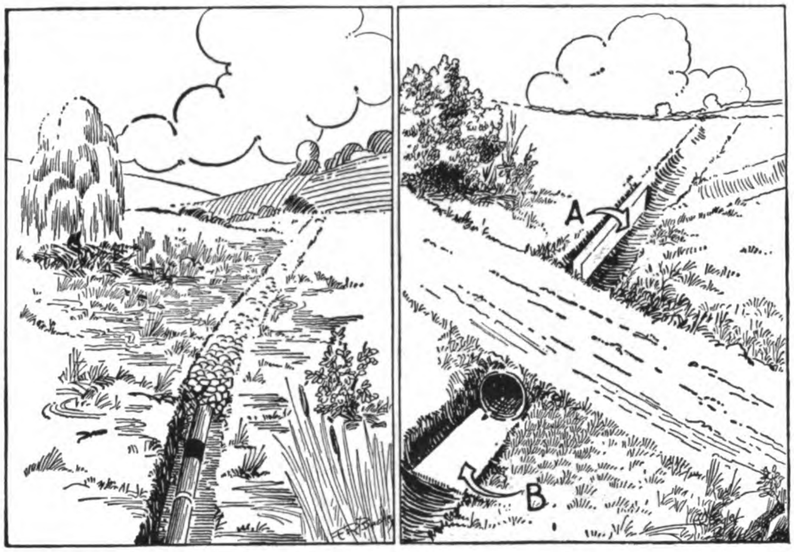

FIGURE 99.—Drainage ditches. *A*—Showing splash board for ditch junction. *B*—Showing splash board at ditch junction and culvert under roadway, with concrete slab at downstream end of culvert.

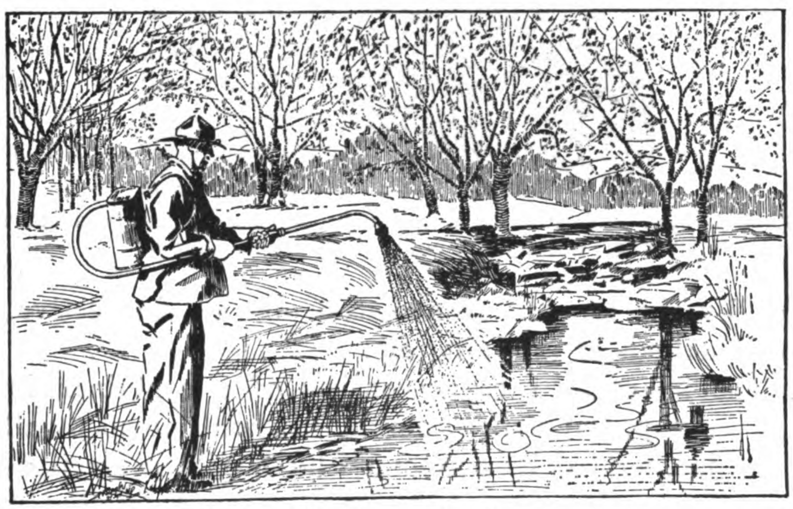

FIGURE 100.—Knapsack oil sprayer.

(2) *Destruction of larvae.*—Measures for the destruction of larvae are all of a temporary measure and must be repeated at least every 7 to 10 days. The most common larvicides are crude oil, waste motor oil, kerosene, paris green, and Panama larvicide.

(*a*) *Oiling.*—A continuous film of oil must be maintained on the surface of the water for 2 or 3 hours in order to kill the larvae.

About one-half pint of oil is required for each 100 square feet of water surface. Crude oil, fuel oil, waste motor oil, or various mixtures of these oils may be used. The heavy grades of oil must be thinned in order to obtain a film, especially in cool weather. The killing effect is caused by the toxic action of the volatile gases after

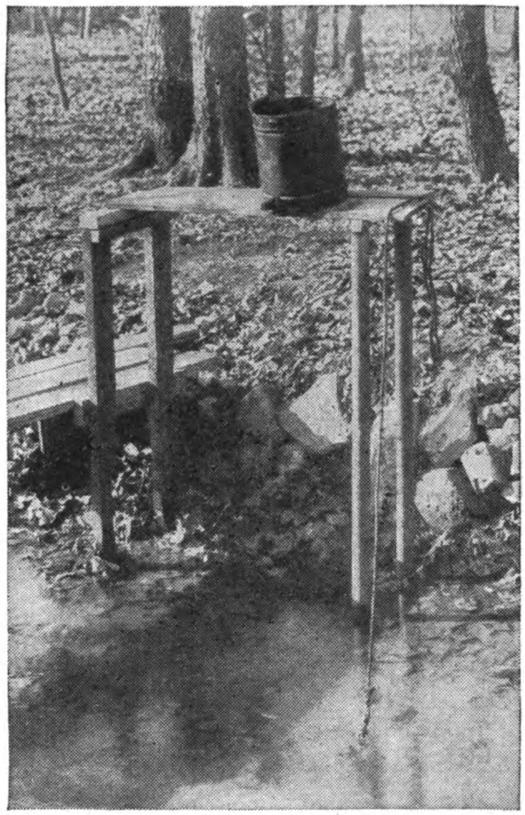

FIGURE 101.—Drip oiler made from 5-gallon oilcan. Regulator consists of nail and cotton plug. Suitable for oiling water in small ditch.

inspiration by the larvae. Nonvolatile oils are ineffective. There are various methods of applying oil:

1. The knapsack sprayer consists of a container for oil, a pump, and a spray nozzle. It holds about 5 gallons and is operated by one man who carries it strapped on his back. Its range is up to 25 feet. It is used for small ponds, pools, ditches, and the banks of streams. Larger sprayers may be used for larger bodies of water.

2. A watering can may be used, but it is a slow method.

3. A drip oiler may be used in slow-moving streams. It will maintain a film of oil over indentations in stream banks and over stream eddies. It requires little attention. The oil must be adapted to the temperature. The oiler

is made from a container such as a galvanized iron can, a 5-gallon oilcan, or a bucket. A small hole is made in the bottom. In this is inserted a regulator or wick consisting of a nail wrapped in cotton or gauze. The oiler is set on boards over the stream. The rate of flow should be regulated to about 20 drops per minute for each foot width of the stream.

4. A submerged oiler may be used either in streams or ponds. One method is to fill a burlap sack with oil-soaked sawdust, weigh it down with rocks, and place it in the stream. Oil will gradually come to the surface. Another method is to anchor to the bottom of the stream a tin can of oil with small holes in the top and bottom.

(b) *Paris green.*—Paris green is mixed with 100 parts of road dust or fine ashes before application. It is useful only against the *Anopheles* mosquito, which feeds on the surface. The mixture may be applied by hand, by hand blowers, or by spreading from an airplane. One-half ounce of paris green diluted with 100 times its volume of road dust will be sufficient for 1,000 square feet of water surface. In this amount it will not harm fish.

(c) *Panama larvicide.*—Panama larvicide is a phenol larvicide. It is made by heating 5 gallons of crude carbolic acid until it is steaming hot, stirring in 6 pounds of crushed rosin, then stirring in 1 pound of caustic soda dissolved in 1 pint of water. This larvicide is mixed with five parts of water and is ready for use. In treating bodies of water enough of the larvicide is added to form an emulsion of about 1 to 5,000. It is thus necessary to know the volume of the water being treated. The larvicide may be applied with a spray or may be poured into the water. It will not destroy fish.

(d) *Natural enemies.*—Many fish will eat mosquito larvae. The most efficient of these is *Gambusia affinis*, a top feeding minnow. These are particularly valuable in small ponds or slow flowing streams.

(3) *Destruction of adults.*—(a) *Swatting.*—Swatting is the simplest means of disposing of mosquitoes which have entered buildings. It can be more easily accomplished at twilight and just after daybreak, at which time mosquitoes collect on screens, doors, and windows. An ordinary fly swatter or folded paper may be used.

(b) *Spraying.*—Spraying is of value in buildings. The ordinary pyrethrum spray is effective for the purpose. The spray should be directed at the walls and ceilings.

(4) *Protection.*—Protection from mosquitoes is necessary both for patients under treatment for insect-borne diseases and for healthy individuals. Its object is both control of disease and freedom from discomfort.

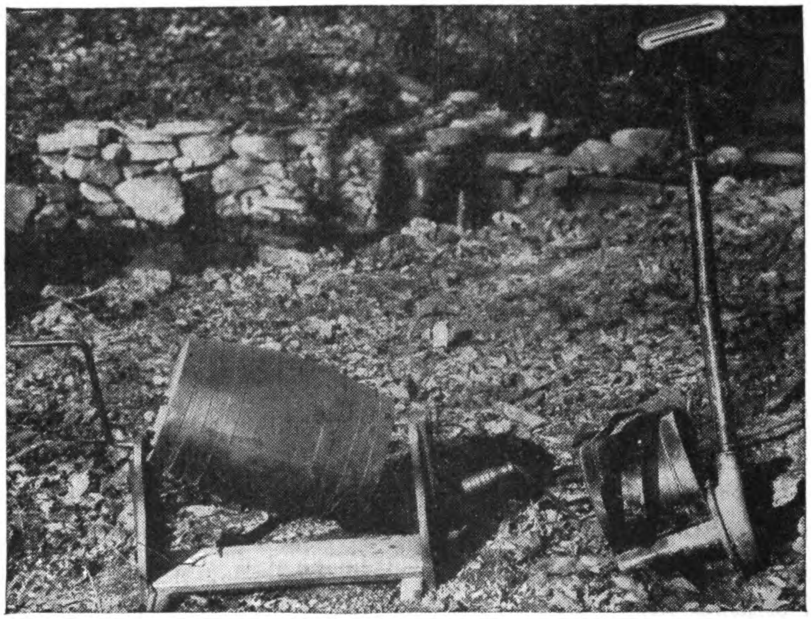

FIGURE 102.—Equipment for mixing and applying paris green larvicide.

FIGURE 103.—Method of producing dust cloud of paris green larvicide with hand-operated dust blower.

(*a*) *Screening.*—Screening is of value only if maintained in perfect repair. A mesh of 18 wires to the inch is necessary to exclude *Anopheles*. Vestibules with double screen doors are of value in

excluding mosquitoes from buildings. Screen doors should open outward and should have strong springs.

(*b*) *Netting.*—Mosquito nets or bars are to be used on beds in all areas when mosquito-borne diseases are endemic. Their use must be enforced by the unit commander. They may be used on T-bars or suspended from the inside or over the outside of the shelter tent. No part of the net should touch the sleeper. They must be tucked in on all sides while in use. During the daytime they must be rolled. They should be inspected regularly for holes, ripped seams, and tears. Nets are to be carried as part of the soldier's equipment in malarial countries. Where *Anopheles* are prevalent, head net and gloves should be used for members of the guard and others on outside duty.

(*c*) *Repellents.*—Repellents are mixtures which, when daubed on the skin, partially or completely repel mosquitoes. They are for the most part difficult to secure and keep. The following ones are easy to prepare.

1. Melt 60 grains of white petrolatum and add 15 cc. citronella oil, 8 cc. of spirits of camphor, and 8 cc. of oil of cedar wood. Stir well, pour into jars, and cool rapidly. This must be kept cool and tightly capped. A small amount applied to the face and neck will last through the night.

2. A mixture of 1 part Epsom salts and 10 parts water daubed on the skin is moderately effective in repelling mosquitoes.

258. Control of lice.—*a. Diseases transmitted.*—Lice transmit typhus fever, trench fever, and relapsing fever.

b. Classification.—The species of lice which infest man are—

(1) *Pediculus humanus corporis* ("body louse," "cootie"). This species is the one chiefly responsible for the transmission of louse-borne diseases.

(2) *Pediculus humanus capitis* (head louse).

(3) *Phthirius pubis* (crab louse).

c. Military importance.—The louse-borne diseases are particularly important to the Army in time of war since lice thrive in conditions of crowding and difficulty of personal cleanliness.

d. Life cycle.—The life cycle of the louse consists of three stages—the egg, larva, and adult.

e. Characteristics.—(1) The head louse ordinarily remains attached to the hairs of the head. The crab louse is found mainly about the genital region but may be found attached to the hairs of any part of the body. The body louse, however, remains attached to the clothing except when feeding.

(2) Lice are spread by adult lice or eggs being dropped off the body in straw, debris, blankets, clothing, or latrine seats. Crab lice may also be disseminated by sexual intercourse.

(3) Lice and their eggs are killed in 5 minutes by dry heat of 131° F. and in 1 minute at 155° F. They are killed in 30 seconds in boiling water.

(4) Lice do not transmit disease by the act of biting. They defecate as they feed. The disease viruses are contained in their excreta and are scratched into the skin by the human host.

f. Delousing.—(1) Delousing must be universally effective throughout the unit. All individuals, their clothing, and their equipment should be disinfested simultaneously. If one individual is missed, reinfestation of the entire unit will soon occur. Prompt action should be taken at the first indication of lice in a unit.

(2) Delousing of a unit includes the following procedures:

(*a*) All individuals to bathe thoroughly and to shave various parts of the body if necessary.

(*b*) Clothing and equipment to be deloused.

(*c*) Latrines, beds, and any objects possibly harboring lice to be disinfested or destroyed.

(*d*) Clean clothing to be issued to all individuals.

g. Bathing.—(1) *General.*—Bathing is an essential part of any delousing program and should be performed while clothing and equipment are being deloused. It may be carried on either in a fixed installation such as a quartermaster bathing and delousing unit or by means of improvised shower baths. An excellent soap to use is made as follows:

Boil one part of ordinary issue soap in four parts of water.
Add two parts of kerosene.
Mix with four parts of water.

(2) *Showers.*—(*a*) A simple device for bathing can be made from a water sterilizing bag suspended from a scaffold or a tree limb. One faucet of the bag is replaced by a rubber tube, in the end of which is placed a short section of pipe closed at one end and perforated in numerous places to act as a shower head. A stone-filled soakage pit should be constructed underneath the shower, being covered with boards on which the men may stand. A grease trap should be installed if the pit is to be in use for more than 2 days.

(*b*) A large tin can, such as a gasoline can, with a perforated bottom may be suspended from a tree or platform. In its operation one man pours water through the can while another bathes.

(c) A more elaborate device may be made by inserting a small perforated tin can into a hole cut in the bottom of a barrel. The valve is constructed of a plunger which fits into the can. This plunger is controlled by means of a lever and handle within reach of the bather.

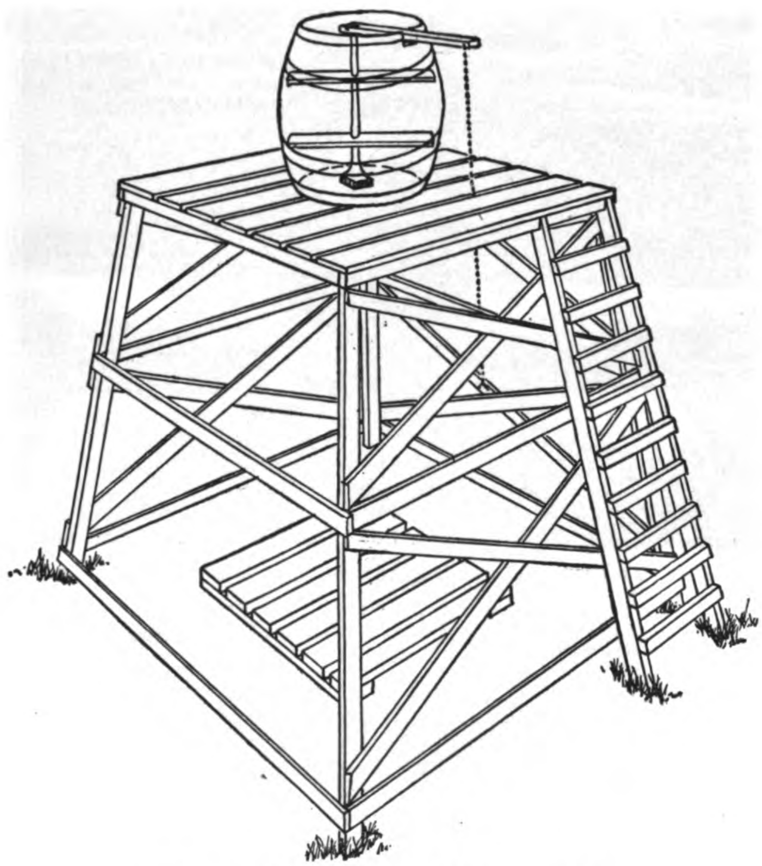

FIGURE 104.—Improvised shower bath.

h. Shaving.—Bathing with soap will not always destroy all of the eggs attached to the hairs of the body. When infestation is evidenced by the presence of eggs on the hairs or by indication of louse bites, the hair in the armpits, about the genitals, and if necessary on the chest and legs should be shaved or clipped. In peacetime, shaving should be routinely employed for the removal of crab lice. If at any time shaving or clipping is not practicable, the infested parts of the body should be thoroughly scrubbed with vinegar, kerosene, or gasoline. This will remove the eggs as well as the adults.

i. Shampooing.—If head lice are present, disinfestation can be accomplished by loosening the eggs from the hairs by the thorough application of vinegar followed by shampooing the scalp with hot, soapy water containing 25 percent of kerosene. This removes the

detached eggs and kills the adult and larval forms. After shampooing, the hair should be combed with a fine-toothed comb to remove any nits not removed by washing. Where practicable the hair should be clipped short.

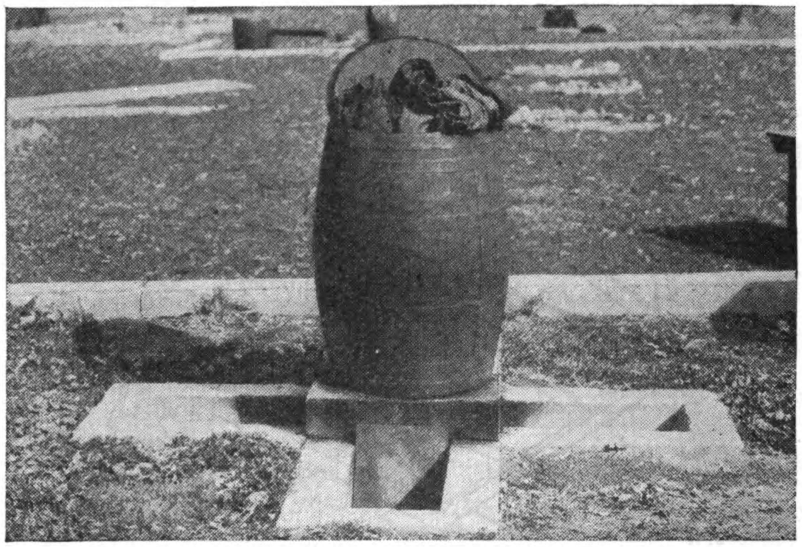

FIGURE 105.—Disinfestor, Serbian barrel type.

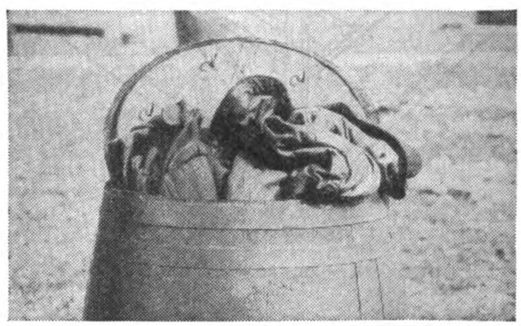

FIGURE 106.—Hooks for suspending material in Serbian barrel.

j. Disinfestation of clothing and equipment.—(1) *General.*—Improper treatment will damage certain materials. Steam will not seriously affect cotton or woolen cloth but will seriously damage articles made of leather, felt, or webbing. Boiling water will shrink woolen cloth. Dry heat is practically harmless for all articles except wool, which it will damage somewhat.

(2) *Available methods.*—Outside of permanent installations and delousing units, the disinfestation of clothing and equipment is done by means of one of the following methods:

(*a*) Mobile disinfestor (quartermaster function).

(*b*) Serbian barrel type of disinfestor.

(c) Improvised hot air disinfestors.
(d) Hot irons.
(e) Hot water.
(f) Storage.
(g) Chemicals.

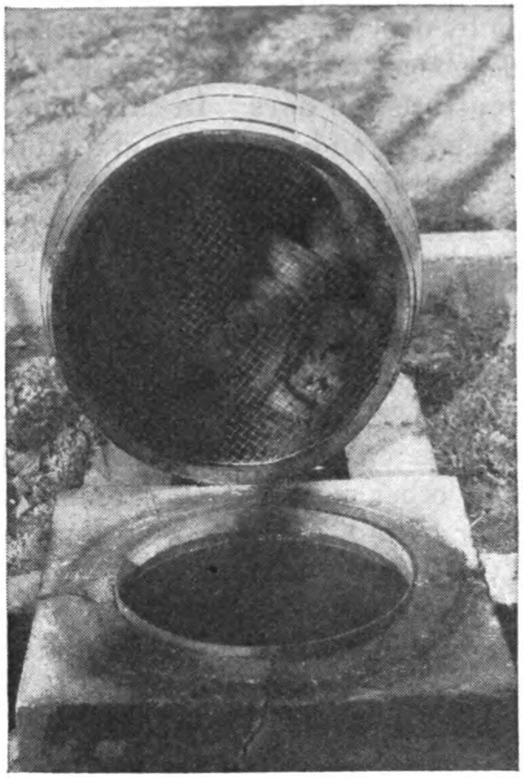

FIGURE 107.—Disinfestor, Serbian barrel type, showing water pan and wire netting across lower opening of steamer.

k. Serbian barrel.—Serbian barrel type disinfestors are company installations. They consist of a barrel or a similar container for the material to be disinfested, below or in the lower part of which there is a receptacle for water and an improvised furnace or firebox.

l. Hot air.—Clothing and equipment may be placed in ovens, boxes, or cans and subjected to dry heat. Small buildings or dugouts may be converted into hot air disinfestors by installing heating apparatus which will heat the air to 160° F. Clothing should be hung loosely and exposed for about 30 minutes.

m. Hot irons.—Clothing can be deloused by removing the adult lice by hand and then killing the eggs by ironing the cloth, especially the seams and folds, with a hot iron. An ordinary sadiron or a piece of iron pipe or scrap iron with a wooden handle may be used for this purpose. This method is laborious and uncertain.

n. Hot water.—Cotton, linen, or silk clothing may be disinfested by immersion in boiling water for 1 minute. This will kill the virus of the insect-borne diseases as well as the lice. A temperature of 135° F. for 5 minutes will kill lice but will not destroy the viruses. This method should not be used for wool, leather, felt, or web material.

o. Storage.—Storage of infested clothing and equipment will accomplish disinfestation by depriving the lice of a food supply. The exact time required is dependent on the temperature. A safe rule is keep articles in storage at least 30 days. In this time successive batches of eggs will have hatched, and the larvae and adults will have died. This method is frequently very practical for disinfesting clothing and blankets in hospitals and camps, providing storage facilities are available and clean clothing and equipment are available. The storage rooms should be kept dry. Freshly infested articles should not be placed with those that have been in storage for some time. No article should be removed from a room until all articles have been in storage at least 30 days.

p. Chemicals.—Leather, web materials, shoes, and hats which cannot be disinfested by other means should be immersed in a 5 percent solution of cresol for 30 minutes. Clothing may be disinfested in 2 percent cresol, but this is rarely advisable.

259. Control of ticks.—*a. General.*—The common wood tick is the most important tick found in the United States insofar as transmission of disease to man is concerned. This tick is the vector for Rocky Mountain spotted fever. In endemic areas it is estimated that 1 percent of wood ticks harbor the spotted fever virus. It is also one of the agents by which tularemia is transmitted from animal to animal and from animal to man. It is found quite generally throughout the United States. The rabbit tick and dog tick are also concerned in the transmission of Rocky Mountain spotted fever. Ticks have been found to be the transmitting agent of relapsing fever in Central America, Venezuela, and Colombia.

b. Characteristics.—Adult ticks can live for 2 years without food. Cold delays the development of the immature forms, but extremely cold weather will not kill ticks in any stage, nor will it destroy the virus of Rocky Mountain spotted fever.

c. Control.—(1) Control of tick-borne diseases by the eradication of the tick is difficult to achieve and is in many instances impracticable. Buildings of little value infested with ticks should be burned. If found desirable, a kerosene or cresol insecticide may be applied to tick-infested floors, walls, ceilings, or furniture. It should be applied as described in paragraph 260. Control of the tick must be attained

mainly by control of its wild animal hosts. As the tick feeds principally on the smaller animals such as squirrels, rabbits, prairie dogs, or woodchucks, the eradication of these animals from an infested area is an important factor in tick control. This may be done by trapping, shooting, and poisoning of wild rodents. Where practicable, burning of the underbrush will reduce the number of animals and will also destroy some of the ticks. Sheep grazing is also a valuable means of reducing the number of ticks.

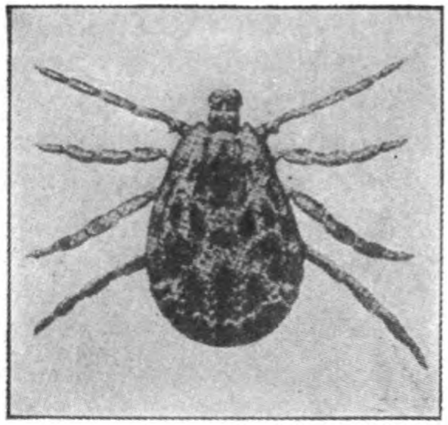

FIGURE 108.—*Dermacentor andersoni* (wood tick).

(2) All individuals in tick-infested localities should frequently examine their exposed skin areas and promptly remove any ticks found. This may prevent disease since ticks may not infect a person until some time after they have attached themselves to him.

260. Control of bedbugs.—*a. General.*—Bedbugs exist wherever they can live in close association with man. They frequently become a serious pest in barracks and guardhouses. It has not been proved that bedbugs transmit any disease to man. Because they are blood-sucking insects, however, it is possible that they may transmit any disease in which there is a blood stream infection.

b. Characteristics.—(1) Bedbugs develop through the egg, larva, and adult stages. The eggs are white, oval in shape, and about 1 millimeter long. They are deposited in cracks, crevices, and any place which affords protection and concealment.

(2) Bedbugs feed at night. They are capable of surviving for 6 months or more without food.

(3) Bedbugs are usually spread from place to place in clothing, bedding, baggage, or furniture. They hide in the seams of mattresses and pillowcases and in cracks and crevices of any wooden or metal structure.

c. Control measures.—(1) *Fumigation.*—Fumigation is the most effective bedbug control measure but should not be attempted by untrained personnel.

(2) *Liquid insecticides.*—Liquid insecticides are effective if thoroughly and repeatedly used. An effective mixture for this purpose is kerosene containing 10 percent of cresol or 5 percent of turpentine. Kerosene alone may be used. A kerosene or alcoholic extract or pyrethrum is also effective. A paint brush should be used in the application of the liquid insecticide. A spray is not as effective. This procedure should be repeated three or four times at intervals of 1 week to kill all developing eggs. Steam should be used to eradicate bedbugs from mattresses, blankets, and other bedding. Dry cleaning with gasoline and washing in hot water will usually get rid of them. Hand picking, brushing, and shaking is recommended. Flaming the cracks of steels cots with a blowtorch is quite effective. Kerosene may be used as a repellent by saturating with it wicks of woolen material placed in the coil springs of metal cots. Fresh applications of kerosene should be made weekly.

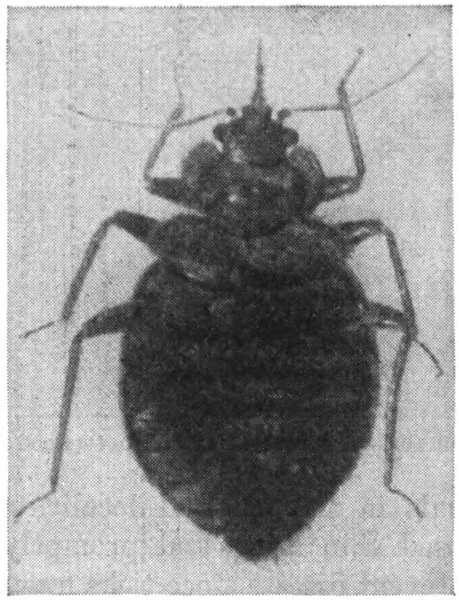

FIGURE 109.—*Cimex lectularius* (common bedbug of temperate zone).

261. Control of roaches and ants.—*a. General.*—Roaches and ants are not transmitting agencies for any insect-borne diseases. They are, however, serious nuisances in messes and may transmit intestinal diseases by contamination of food.

b. Control.—(1) The most important control measure is to deprive ants and roaches of an available food supply by cleanliness of the

mess and by protection of food supplies by refrigerators and screened cabinets. The placing of table and refrigerator legs in cans containing water will protect food from ants.

(2) Sodium fluoride should be placed in cracks and corners and about water pipes two or three times a week. Spraying of cabinets, corners, and cracks in the wall with the issue liquid insecticide will destroy many roaches. This is best done at night.

(3) Complete eradication of ants can be accomplished only if their nest is found and destroyed. Once located, the nest may be destroyed by pouring boiling water or kerosene into it.

262. Control of fleas.—*a. General.*—Several varieties of fleas are vectors of bubonic plague and endemic typhus fever. Various small animals, particularly rodents, serve as reservoirs of infection from which fleas may transmit bubonic plague or endemic typhus fever to man. The rat flea is the most common vector. Fleas rarely select man as the host of choice, but they may transfer themselves to man whenever he comes in association with their usual small animal hosts.

b. Control.—(1) *Elimination of animal hosts.*—Elimination of animal hosts is the essential control measure. It must include attention not only to rats and squirrels but also to pet dogs and cats.

(*a*) Pet animals may be freed of adult fleas by a variety of commercial preparations. Washing in 3 percent solution of cresol or 10 percent emulsion of kerosene, followed by thorough rinsing, will also destroy fleas. While pets are being treated, blankets or beds occupied by them should simultaneously be distinfested.

(*b*) Rats are not only important as reservoirs of infection of bubonic plague and typhus fever but are also factors in the spread of several other diseases. Control of rats is a difficult problem. The supervision of rat-control campaigns is a normal function of the Medical Department. The principal control measures are as follows:

1. Trapping is an effective rat-control measure but requires considerable skill since rats quickly become suspicious of traps. It is very important not to leave the odor of human hands on trap or bait. A snap type of trap is preferable to a cage trap. The bait may be fried bacon, fish, cheese, liver, fresh bread, doughnuts, cantaloupe, or tomato. The bait must be securely fastened to the trap. Traps should be located at points normally frequented by rats. Traps may be deodorized by flaming or by dipping in hot paraffin.

2. Poisoning is the most valuable control measure. It is, however, a rather complicated procedure if properly done. See FM 8-40.

(2) *Destruction of fleas.*—Fleas in buildings may be destroyed by scrubbing the interior of the rooms with soapy water containing 10 percent kerosene and 5 percent cresol. The floor should be thoroughly wet. Barns and barnyards may be disinfected by spraying with a creosote oil containing 10 percent tar acids.

SECTION VI

PREVENTION AND CONTROL OF VENEREAL DISEASES

263. General.—*a.* Venereal diseases are by far the most important causes of noneffectiveness among troops.

b. Venereal diseases are in no sense military diseases. Their prevalence among civilian populations is difficult to determine but is probably greater than in the Army. Studies have shown that at least 60 to 70 percent of prostitutes in the United States are infected, and it is probable that the actual incidence is much higher.

c. The four diseases claimed as venereal are—

(1) *Gonorrhea.*—Caused by the gonococcus.

(2) *Syphilis.*—Caused by a corkscrew-shaped organism; the *Treponema pallidum.*

(3) *Chancroid.*—Caused by the bacillus of Ducrey.

(4) *Lymphogranuloma inguinale.*—Cause by a filterable virus.

(5) *Granuloma inguinale.*—Probably caused by Donovan body.

d. These diseases are usually transmitted during sexual intercourse. Syphilis is most commonly transmitted during sexual intercourse, but the primary lesion, the chancre, may occur on any part of the body. Infection may result from using a common drinking cup, from kissing, or from being bitten by a woman who has open lesions of syphilis in her mouth.

264. Control measures.—*a. Responsibility.*—The venereal disease rate of an organization is usually a rather close index of the state of discipline, training, and administration of that organization. The responsibility for venereal disease control rests primarily on unit commanders. The principles of transmission of venereal disease are simple and are easily understood by all persons.

b. Prevention of exposure.—The most important fact to be kept in mind by all individuals is that almost all women who will permit

promiscuous sexual intercourse are infected with venereal disease. Sexual intercourse is not essential to health, and efforts should be directed toward preventing exposure to infection.

c. Prophylactic measures.—In spite of warning, many individuals will expose themselves to infection. Mechanical and chemical means of preventing the development of infection give a fairly high degree of protection, but only so when promptly, intelligently, and thoroughly applied.

(1) *Mechanical.*—The condom affords the only practical mechanical protection against venereal infection. Post exchanges are required to stock condoms of approved quality. A condom will prevent gonorrheal infection, which must enter the urethra. It is not certain protection against syphilis, chancroid, or lymphogranuloma inguinale, which may enter the skin and tissues about the genitals. Consequently, chemical prophylaxis must be given even after a condom has been used.

(2) *Chemical.*—(*a*) *Prophylactic stations.*—The Medical Department is responsible for operating sufficient prophylactic stations to serve adequately each command. In many situations it is advisable to establish such stations in civilian communities adjacent to Army stations or camps. Prophylactic stations may be established even in bivouacs. Chemical prophylactic treatments are given in these stations by trained enlisted men of the Medical Department. Any soldier may apply for treatment regardless of the hour. The chemical prophylaxis given is highly effective if administered within 30 to 60 minutes of the time of exposure. Its effectiveness decreases rapidly after that time. The attendant at the station gives each soldier a signed record of the treatment, showing the date, hour, and place of treatment. This treatment cannot be satisfactorily administered to a man who is drunk because individual cooperation is necessary.

(*b*) *Prophylactic equipment.*—The following equipment is necessary for a prophylactic station:

1. Protargol solution, 2 percent, freshly prepared weekly. Keep in amber-colored bottles.

2. Bichloride of mercury solution, 1–1,000. Poisonous. Does not deteriorate.

3. Sufficient calomel ointment, 30 percent. Well mixed. Does not deteriorate.

4. Sufficient liquid soap in a bottle with a shaker top made by inserting a glass tube through the cork.

5. At least 1 dozen serviceable urethral syringes. Keep in a closed jar.

6. Tongue depressors. Keep in a closed container. To be used to remove the calomel ointment from the jar.

7. Sterilizer for syringes. They must be washed thoroughly in soap and water, then sterilized by boiling for 5 minutes.

8. Sponge holder, to be used by soldiers in removing syringes, tongue depressors, gauze, and sponges.

9. Running water or at least 1 dozen wash basins.

10. Sufficient 2-ounce medicine glasses, into which protargol is poured before use by the soldier.

11. Clock.

12. Roll of absorbent paper.

13. Towels, linen or paper.

14. Large, easily read labels for everything the soldier is required to use.

15. Well lighted room, preferably with an anteroom as a waiting room, and a small adjoining room or booths with either a large trough with running water or individual porcelain troughs in each booth.

16. Sufficient blank forms W. D., M. D. No. 77 (Venereal Prophylaxis Slip) to be made out properly and kept on file for at least 3 months. When the soldier receiving prophylaxis is from another organization, send a duplicate copy of W. D., M. D. Form No. 77 to his commanding officer next day.

17. Place to wash hands.

(*c*) *Prophylactic procedure.*—The prophylaxis must be given by a trained attendant. Some of the steps in the prophylaxis may be self-administered but they should be closely supervised by the attendant.

1. Examine penis for signs of venereal disease. If any sign of venereal disease is seen, do not administer prophylaxis until soldier is seen by a medical officer.

2. Have soldier urinate and wash his hands.

3. Have soldier wash penis, scrotum, and adjacent area of his body thoroughly with liquid soap and warm water. Flush off with 1–1,000 bichloride of mercury solution.

4. By means of a syringe inject a teaspoonful of 2 percent protargol into penis. Have soldier close the opening with his thumb and finger and retain the solution for 5 minutes by the clock. Too much pressure must not be placed

at the end of the penis. This is where the germs, if present, are likely to be most numerous. Release pressure very slightly at intervals to allow for thorough bathing of end of opening.

5. Have soldier pull back the foreskin; thoroughly rub into the penis and surrounding body area about a teaspoonful of calomel ointment, 30 percent. Rub in for at least 3 minutes. Wrap penis in a towel or paper. Instruct the soldier not to urinate for at least 4 hours if possible.

6. Complete the prophylaxis slip. Have soldier sign. Give him one copy. File another copy for 3 months.

(3) *Emergency.*—If a soldier has exposed himself and has neither a prophylactic tube nor access to a station, he should empty his bladder, and then scrub his genitals and the surrounding skin areas with soap and water. This may serve to prevent infection.

d. Punitive measures.—Any individual who knows or believes that he has contracted a veneral disease must report that fact to his immediate commanding officer without delay. Trial by court martial or other disciplinary action for concealing a veneral disease is discretionary with the commanding officer. No disciplinary action is authorized for failure to take prophylaxis or for having contracted a venereal disease.

(2) Any person in the military service who loses time from duty because of a venereal disease forfeits his pay during the time so lost and must make good the time lost.

e. Physical inspections.—The periodical physical inspections which are conducted at least once each month for all enlisted men below the first three grades include inspection for evidence of venereal disease. Additional inspections may be arranged if it is believed that some men may be concealing venereal disease. These are most effective if conducted early in the morning or just after return from outdoor activity.

f. Treatment.—All cases of venereal disease should be promptly sent to the hospital or dispensary for treatment. Early treatment offers far better chances of cure than does delayed treatment. Self-treatment and treatment by unskilled individuals are both ineffective and dangerous.

SECTION VII

PREVENTION AND CONTROL OF MISCELLANEOUS DISEASES

265. Lockjaw (tetanus).—*a.* Tetanus (lockjaw) is a serious disease, having a mortality rate which may be as high as 80 percent. It is caused by the tetanus bacillus which is an anaerobic organism (one which lives in the absence of oxygen). Tetanus bacilli enter the body by way of wounds.

b. Any wound other than small, superficial scratches should be treated by skilled medical personnel. This is especially true of puncture wounds from nails or from spikes on athletic shoes. The treatment should be obtained promptly so that wounds may be cleaned out before tetanus bacilli gain a foothold. (See AR 40-240.)

266. Gas gangrene.—*a.* Gas gangrene is an acute infection occurring in large, crushed wounds contaminated with human or animal wastes found in soil. The infection is usually associated with compound fractures and large wounds that come in contact with the soil, but it has occasionally followed puncture wounds. Once the disease develops it is extremely difficult to control. The mortality is very high.

b. Control depends on early and proper surgical treatment and the use of sera. The first-aid precautions are the same as those for tetanus.

267. Rabies.—*a.* Control of rabies depends on the prevention of the disease in dogs, treatment of wounds, and prophylactic treatment to prevent the development of the disease. (See par. 142*c*.)

b. Dogs can be protected against rabies by specific vaccination which should be repeated each year. A metal tag giving the date the treatment was given should be attached to the collar of the dog.

268. Scabies.—*a.* Scabies, also known as seven-year itch, is an acute inflammatory condition of the skin due to the presence of the itch mite.

b. Scabies is an important condition because of its adverse effect on the morale and efficiency of the individual or groups. It entails an average loss of time of about 10 days in cases admitted to quar-

ters and hospital. Complicated cases are frequently in hospital for several weeks.

c. The source of infestation is the person with scabies. Direct body contact is the common mode of transfer but indirect contact through clothing, blankets, or equipment may occur. Clothing from infested individuals may harbor the live parasites for at least 11 days.

d. A medical officer should supervise the disinfestation of a group of individuals having scabies. The spread of scabies from infested recruits or isolated cases is controlled by securing body cleanliness, cleanliness of clothing and blankets, and by preventing overcrowding.

269. Ringworm.—*a. General.*—The terms "trichophytosis" or "ringworm" includes a group of skin infections due to parasitic fungi. Numerous different fungi may be responsible for these infections, and all parts of the human body may be involved. All of these infections tend to become chronic, and all thrive in warm weather or under other conditions which result in perspiration. They are very common in all walks of life. They may be so mild as to be barely noticeable, or so severe as to be completely disabling.

b. Control.—(1) *General.*—The control measures for all the forms of ringworm infection are essentially the same. The main objective is to prevent the bare skin of noninfected individuals coming in contact with any objects which may have been contaminated by infected persons.

(2) *Care of feet.*—Proper care of the feet is particularly important in the prevention and control of trichophytosis. It is especially important to keep the feet dry. If the feet tend to perspire excessively, the issue foot powder should be applied twice daily. Formaldehyde or other drying solutions should not be applied to the feet unless advised by a medical officer.

(3) *Foot baths.*—If ringworm of the feet is prevalent in a command, all bathhouses should be equipped with foot baths. The tubs should be located at the entrances to the showers and should be broad enough so that all individuals will have to step in them going both to and from the showers. They should be at least 6 inches deep, and should be constructed of concrete or rubber. They should contain a solution of grade *A* calcium hypochlorite in the proportion of 1 ounce of the dry chemical to each gallon of water. A fresh solution should be prepared daily.

(4) *Disinfection.*—The most effective control measure is disinfection of bathhouse floors and equipment, and by the disinfection of towels, swimming or gymnasium suits, and similar articles. Bathhouse floors and equipment, including mats, benches, and chairs,

should be scrubbed daily with soap and water. It is also advisable to scrub them with a disinfectant such as 2 percent cresol, or a solution of calcium hypochlorite, 1 ounce to the gallon of water. There should be removable duckboards in shower baths. These should be thoroughly scrubbed and then exposed to the sunlight for several hours each day. Individual slippers of rubber are useful in preventing contact of the bare feet with infected surfaces. The exchange or common use of towels, gymnasium suits, slippers, shoes, or gloves should be avoided unless they have been thoroughly disinfected after use. All articles that will not be damaged by boiling should be sterilized in that manner. Leather and rubber goods can be disinfected with cresol solution. Shoes can be disinfected by a 1 percent solution of thymol in gasoline or alcohol. This solution is poured into the shoes and allowed to evaporate.

(5) *Swimming pools.*—Swimming pools constitute a potent means for transmission of fungi unless properly operated.

270. Poison ivy, poison oak, and poison sumac (plant dermatitis).—*a. General.*—(1) The poison ivy, poison oak, and poison sumac are the common plants that produce skin irritation in susceptible persons. The poison ivy is distinguished from other suspected creepers of a similar appearance by its possession of three leaves instead of five. The poison oak, which grows especially in the western part of the United States, is a shrub or small tree. The poison sumac, also know as poison elder or dogwood, is a shrub or small tree growing in swampy places.

(2) The harmful part of these plants is the resinous sap which exudes from all injured surfaces. Actual contact with the sap is necessary; however, contact with the plant may not be essential as the sap can be carried on clothing, tools, and hands, or transmitted on the bodies of insects or in the smoke coming from fires burning the plants.

b. Control.—(1) One should learn to recognize the plants and avoid them when possible. Destroy the plants in occupied areas. Contamination in camps can be avoided by requiring all men working in or about the plants to—

(*a*) Wear gloves while at work.

(*b*) Change outer clothing and gloves before associating with the other men in the camp.

(*c*) Keep contaminated tools and implements separate.

(*d*) Burn poisonous vegetation to a considerable distance from the camp site and always at such time and place that the wind will carry the smoke away from the camp.

(2) The following personal measures should be observed:

(*a*) Contaminated clothing and implements should be well washed with water (soda water if possible) or exposed to the direct rays of the sun for several hours.

(*b*) All parts of the body that have been exposed to the plants should be well washed with a strong soap solution or alcohol. Gasoline or kerosene may be used. The washing must be prompt and thorough or else it will tend to spread the poison.

(*c*) Skilled medical treatment should be promptly sought if the skin eruption appears.

SECTION VIII

ORAL HYGIENE

271. Oral hygiene.—*a. Definition.*—The term "oral hygiene" refers to all the measures used by the individual to keep the mouth in a healthy condition.

b. Factors concerned.—The health of the mouth and teeth is dependent upon three factors: first heredity; second, the general health of the individual; third, the daily care of the teeth and gums. The teeth and gums should be brushed thoroughly twice a day (night and morning) with proper brush and dentrifice (paste or powder) and each individual should have his mouth examined by a dental surgeon at least twice a year.

c. Purpose.—Many diseases that result from mouth conditions may be avoided. Even decay (caries) of the teeth and inflammation and infection of the gums and the membrane which holds the teeth in their sockets may be controlled to a great extent by simple methods of cleaning at regular intervals.

d. Professional and individual care.—(1) The program of oral hygiene for the soldier should be a cooperative one between the patient, who is responsible for individual care, and the dental surgeon, who advises and directs it. The dental surgeon has the added responsibility of keeping the mouth in such condition that individual care may be most effective. Professional care by the dental surgeon should be considered only as an aid to individual care. Cleaning by the dental surgeon should be necessary only where individual care fails to show the desired result or as a check-up on errors or lack of interest and effort on the part of the soldier. A dental survey is made once or more each year to encourage the soldier in his efforts as well as to make an estimate of the dental situation in the command.

Periodic cleaning by the dental surgeon is not necessary *if the soldier's care is perfect.*

(2) The individual care that is simple and easy will produce excellent results. After simple methods have been mastered, the dental surgeon will give further instructions to the individual soldier if and when necessary. Each soldier should possess two tooth brushes of proper size and stiffness and use them alternately night and morning. A thorough brushing before retiring is most important as the fluids and food left in the mouth through the night are more liable to cause fermentation or the acid formation that plays such an important role in tooth destruction. Before and after brushing the teeth, rinse the mouth thoroughly with water, closing the teeth and lips and forcing the water back and forth between the teeth. This removes loose food particles and cleanses those surfaces that it is impossible to reach with the brush.

e. Tooth brush.—(1) The selection of the proper brush is very important for each individual. The dental surgeon will recommend the proper brush if requested. As a rule a small brush is more desirable than a large one, and the bristles should be deeply notched crosswise, not set too closely together, and as stiff as can be used without causing pain. All brushes will soften with use to some extent so this must be considered when purchasing a new brush. The bristles on the end of the brush should be short enough to allow free movement far back in the mouth. Those with long tufts on the end should be avoided.

(2) The brush should be rinsed in water a few moments before using. After each use, it should be hung in the air to dry and not allowed to touch any other object.

f. Dentifrice.—Paste or powder, as desired, may be used on the brush, but care should be used to select one that bears the seal of approval of the American Dental Association. Liquid dentifrices or mouth washes should not be used regularly unless prescribed by a dental surgeon.

g. Dental floss.—Dental floss may be used in routine cleaning if necessary. If dental floss is used, the individual must be careful not to injure the gums.

h. Brushing procedure.—A routine procedure for morning and night brushing is as follows:

(1) Place the brush against the gums, far back on the lower right side of the mouth (opposite last two teeth) with the point of the bristles down, that is, with the sides of the bristles parallel to the long axis of the teeth. By rotating the wrist the bristles should

be brought up from this position over the crest of the gums and outer surfaces of the teeth. The pressure on the teeth should be increased toward the end of the stroke to force the bristles into the spaces between the teeth. This movement stimulates the gums and cleans the exposed surfaces of the teeth at the same time. This movement should be executed about twelve times then the brush moved to another position, movement executed, and so on around the lower jaw until all teeth and adjoining spaces have been cleaned. Only two or three teeth can be covered with one application of the brush, depending on the position in the mouth and the size of the teeth. The same should be done for the upper jaw using a downward stroke by rotating the wrist in the opposite direction.

(2) The motions for the inner (lingual) surfaces of the teeth in both arches should be the same as those for the outer surfaces, but they are much more difficult due to the concave arrangement of the teeth.

(3) In the front of the mouth, place the heel of the brush well up or down on the gums and pull the brush forward. This produces the same massaging motion to the gum margins (toward the teeth) and cleans in between the teeth and the inner surfaces.

(4) The grinding surfaces (occlusal) of the back teeth are best brushed with the points of the bristles forced into the grooves or sulci and the brush moved from side to side, back and forward, and in a rotary movement to cleanse and remove all debris from the grooves.

i. Dentures.—Dentures (false teeth) should be thoroughly washed with soap and water—never hot water as it may warp the vulcanized rubber part of the denture. A hand brush makes a good denture brush. Wash dentures after each meal and rinse the mouth with warm salt water. Dentures should not be worn day and night. When out of the mouth they should be kept in salt water.

SECTION IX

PREVENTION AND CONTROL OF INFECTIOUS DISEASES OF ANIMALS

272. General.—*a.* The primary objective of disease control measures among animals of a military force is to promote military efficiency by preventing a communicable disease from attaining such prevalence that it will interfere with the efficiency of the animals of the command.

b. Animals of military commands differ mostly from those of civil communities in the nature of their environmental conditions, especially with respect to crowding and close contact between individuals.

c. It is necessary to maintain a constant lookout for the appearance of communicable diseases or of conditions which may tend to encourage their spread among animals of the command.

273. Resistance.—The normal animal possesses a certain degree of resistance to all infection. The unbroken skin and mucous membranes are the first line of defense against infection. Gastric and intestinal secretions and certain agencies in the blood and lymph offer their share of resistance. Good grooming, wholesome food, regular exercise, fresh air, clean stables and corrals, and dry standings are important aids to the natural resistance offered by the body itself. A healthy animal well cared for can withstand and fight off a certain amount of infection, but will succumb to large quantities. Long shipments, change of environment, exposure, insufficient food, overwork, poor grooming, muddy, filthy corrals and picket lines, and poorly ventilated stables all lower the animals' resistance and render them more susceptible to attack by parasites or bacteria.

274. Pathogenic parasites.—Infectious diseases of animals are caused by pathogenic parasites of which there are several kinds:

a. Microscopic bacteria, as in glanders, anthrax, and tetanus.

b. Ultramicroscopic viruses, as in influenza, encephalomyelitis, and infectious anemia.

c. Moulds and fungi, as in thrush and ringworm.

d. Highly organized ectoparasites, as in mange and pediculosis.

e. Protozoa, as in surra, where the organism is transmitted by the bite of infected flies and possibly other blood-sucking insects, and Texas fever, where the organism is transmitted by the bite of an infected tick.

f. The gastrointestinal parasites, of which the eggs and other infective material may be taken into the tract in contaminated food and water.

275. Incubation period.—A time interval between infection and the appearance of the symptoms is known as the incubation period. This period may vary from a few hours to several weeks.

276. Mode of infection.—The specific organism which is the cause of a given communicable disease reaches the animal body through—

a. Direct contact with another animal harboring the causative parasite or bacteria; this latter animal may be in the incubation stage, may be visibly sick, or may be apparently recovered.

b. Indirect contact with sick animals through the media of stables, corrals, picket lines, stock cars, stock yards, buckets, bits, grooming equipment, hands and clothing of attendants, etc., which have been contaminated by excreta, discharge, or other material of an infective nature.

c. Intermediate vectors, such as mosquitoes, flies, ticks, lice, fleas, etc.

d. Channels of infection. Infection may enter the body with the air which is breathed, in the food and water, through the skin, through the mucous membranes of the nasal passages, mouth, or genital organs, or through wound infection.

277. Significance of communicable disease.—The chief reasons why communicable diseases are so important and require so much attention are that they spread rapidly and if uncontrolled cause a high percentage of ineffectives and permanent losses. Some communicable diseases common to animals are transmissible to humans and therefore receive special consideration for that reason.

278. Discovery of communicable disease.—The early detection of new cases is of primary importance in the effective control and early eradication of any communicable disease. In order to accomplish this, frequent inspection of all animals is necessary. One of the first indications of disease is the loss of appetite. Discharges from the nose or eyes, labored breathing, coughs, loss of hair, or other general symptoms should result in a general physical examination. Early temperature recordings are valuable in the detection of the first stages of disease. An animal standing apart from others should receive careful physical examination.

279. Control.—The primary object of all control measures in a military force is to promote military efficiency by preventing a communicable disease from attaining such prevalence that it will interfere with the mission of the command concerned. This may best be effected by prompt isolation or quarantine measures.

a. Isolation.—This is the removal of the sick from the well animals and the placing of such restrictions on their care and movement that the possibility of spreading infection beyond their immediate surroundings is impossible.

b. Quarantine.—This is the separation of a group containing animals that are actual or potential sources of infection from the remainder of the command for the purpose of preventing the transmission of the infection and is usually applied to animals having contact with a known communicable disease. When it seems reasonable to expect that animals of a group are free from infectious disease but further observation is necessary before final decision is made, it is possible to initiate a working quarantine which allows continued training provided the area used is denied other animals.

280. Disposal of carcass.—*a. General.*—Animals that die or are destroyed as the result of a communicable disease will be disposed of in accordance with best sanitary practices. Animals to be destroyed should, if possible, be led to the place of disposal. Otherwise, destroy and move the carcass in a vehicle, care being taken to prevent contamination of additional area. Disinfect the ground upon which the carcass lay by covering with straw saturated with oil and burning.

b. Burying carcass.—The hole should be deep enough to allow 3 feet of earth on top of the carcass. The required size of the hole may be reduced by dismembering the carcass and puncturing the abdominal viscera to prevent the accumulation of gases. Care should be exercised to prevent contamination of surrounding areas. Cover the carcass with several inches of lime before filling the hole.

c. Burning carcass.—Dig two trenches intersecting at their center at right angles, each trench being 7 feet long, 15 inches wide, and 18 inches deep at the intersection, becoming shallower at the end. The earth is thrown up in the angles formed by the trenches, and two stout pieces of iron rail or wood are placed thereon. Approximately a cord of coarse wood is then placed on these cross members and the carcass is then placed thereon. Coarse wood is then piled over the carcass and the pile ignited with smaller fuel in the trench below. Five gallons of crude oil or kerosene poured over the carcass will hasten the burning. The carcass is usually consumed in 5 or 6 hours.

Blood, manure, nasal discharges, etc., scattered about the ground should be scraped up with the earth and thrown into the fire.

281. Important communicable diseases.—Common infectious diseases of horses which are of importance from an Army standpoint are glanders, shipping fever, dematitis gangrenosa, equine encephalomyelitis, tetanus, botulism, and anthrax. A brief outline of the causes, symptoms, diagnosis, and control measures of each is given in the following paragraphs.

282. Glanders (AR 40-2100).—*a. Cause.*—Glanders is a communicable disease to which horses and mules are peculiarly susceptible, and is caused by infection with the *Bacillus mallei.* It may be acute or chronic and may be transmitted to man. It is practically incurable and practically always results in death. The disease is usually transmitted by the ingestion of food or water which has been contaminated with pus, discharge, or other secretions and excreta of infected animals. Occasionally infection occurs through the respiratory tract.

b. Symptoms.—Many cases show no outward signs. Principal clinical signs are greenish yellow, glue-like, blood-stained nasal discharges, with ulcers or star-shaped scars of the nasal mucous membranes, nonsuppurative, nonsensitive, hard, adherent swelling of the submaxillary lymph glands, and in the cutaneous form (farcy), chains of indurated lymph glands which break down and discharge pus.

c. Diagnosis.—Clinical diagnosis is based on the symptoms, which may be confirmed by mallein and serological tests. Suspicious cases should be isolated until a positive diagnosis has been made.

d. Control.—(1) Isolation of suspects until a positive diagnosis is made.

(2) Destruction of positive cases followed by burning or burial of the carcasses.

(3) Quarantine of all contacts and retesting after 21 days, this date starting from the time of the last positive case found, if any.

(4) Disinfecting and cleaning of area, equipment, etc.

283. Mange (AR 40-2125).—*a. Cause.*—This is an infectious skin disease which may be transmitted to man. It is caused by very small parasites commonly called mites. Of all the causes of wastage of animals in war by the element of communicable disease, this disease stands out as one of greatest importance.

b. Varieties of parasite.—There are three varieties of the parasite causing mange, all of which produce an intense irritation, inflammation, and a progressive destruction of the skin.

(1) The *sarcoptes*, which burrows into the skin, is usually found about the head and neck, but occasionally on other parts of the body.

(2) The *psoroptes*, which attaches itself to the outer surface by the mouth apparatus, obtaining its nourishment from the skin, is usually found in the region of the mane and tail.

(3) The *symbiotes*, which lives on the epidermal scales, is usually found on the legs.

c. Symptoms.—Violent, unceasing itching of the affected parts, the patient rubbing, scratching, and biting continuously. The hair falls out and the skin becomes thickened, wrinkled, and covered with scabs.

d. Diagnosis.—(1) Clinically the disease is suspected from the characteristic lesions, namely, loss of hair over affected areas and the thickening of the skin as a result of the irritation from the parasites. These areas are usually denuded and covered with crusty scabs.

(2) The condition spreads slowly at the start of an outbreak but due to contamination of stable equipment soon affects large numbers of animals.

(3) Microscopically the parasite is demonstrable in scrapings of the affected areas. Since the parasite lives on the lymph, it is necessary to scrape the area until it begins to ooze blood and frequently it is necessary to make several scrapings of the area, as the mite is difficult to find.

e. Prevention.—Thorough grooming tends to prevent the development of this disease. It is important to prevent contact of normal animals with cases of the disease, or with contaminated grooming kits, blankets, or other equipment. Stalls and stables which have housed mangy animals should be thoroughly cleaned and disinfected prior to their use for normal animals.

f. Control.—Isolation of infested animals and contacts, clipping, good grooming and destruction of parasites on animals, together with disinfection of all articles of equipment are essential measures.

g. Treatment.—The successful treatment of mange depends primarily on the destruction of the parasite, whether on the affected animal or anywhere else, as well as such dietetic and constitutional measures as may be indicated. As a preliminary to any antiparasitic procedures, the affected animals should be clipped, care being exercised to burn the hair and disinfect the apparatus and all equipment used.

h. Destruction of parasite.—For the purpose of destroying the parasite on the animals, various types of dips and hand treatments

may be used. They are designated under the name of the parasiticide which forms their base, such as lime and sulfur dip, arsenical dip, tobacco-sulfur dip, tobacco dip, crude oil, sulfurous acid gas in gas chamber, etc. In handling small numbers of animals, the parasiticide may be applied by hand, by spray, or, when available, by gas chamber. When large numbers are to be treated the only practical method is by dipping. The procedures hereinafter described are approved as practical and economical, and should be adopted unless good reason to the contrary exists and equally efficient measures are available.

(1) *Hand or spray method.*—(*a*) The animal should be well rubbed all over with soft soap to which 10 percent of liquid cresol solution compound may be added with advantage. This will serve to soften scabs and after 12 hours the animal should be thoroughly washed, soap and debris being removed. The following parasiticide is then applied:

Sulfur sublimed	2 pounds.
Oil of tar	8 ounces.
Oil of linseed or cottonseed	1 gallon.

(*b*) These ingredients are mixed and heated gradually but not allowed to boil. The mixture should be well rubbed into the skin with a stiff brush at a temperature as high as can be comfortably borne, and allowed to remain for 10 days, when it may be washed off and the application repeated.

(*c*) The dipping mixture made as described in (2) below is equally effective by hand or spray in the absence of a dipping vat. When the spray is used a second attendant should follow with a brush to see that the entire surface is covered.

(2) *Dipping method.*—When a dipping vat is available, the lime and sulfur dip is a valuable parasiticide. When used it will be prepared and applied strictly in compliance with the following instructions.

(*a*) The ingredients and the proportions in which they are to be used are as follows:

Sulfur, sublimed	24 pounds.
Lime (unslaked)	10 pounds.
Water	100 gallons.

(*b*) The mixture is prepared as follows: The lime is slaked so as to form a rather thick paste; the sulfur is then added, and the whole well mixed. In a kettle containing 25 gallons of boiling water, the lime and sulfur mixture is placed, a small amount at a time, with constant stirring, and the contents are then boiled for about 2 hours

(3 or 4 hours' boiling concentrates the mixture), being stirred at intervals. After the sulfur disappears from the surface the mixture, including the sediment, is poured into a barrel provided with a spigot 6 to 8 inches from the bottom. When settling has taken place the liquid is drained off through the spigot into a suitable container and enough warm water added to make 100 gallons. The sediment remaining in the barrel must not be used for dipping purposes but can be utilized to advantage in the disinfection of fences and buildings.

(*c*) The specific gravity of an effective lime and sulfur mixture is 1.023, taken by an ordinary urinometer with the mixture at a temperature of from 105° to 110° F. Should the specific gravity sink below 1.023, more of the stock solution should be added until the correct reading is obtained. When the mixture is too concentrated, as indicated by a specific gravity higher than 1.023, it will require dilution with water.

(*d*) It may be found occasionally at first trial that the formula does not produce the result described, but examination will reveal that there is still free sulfur in suspension, indicating insufficient boiling. Further boiling of the stock solution will yield a product which on proper dilution will give the correct urinometer reading.

(*e*) It is most important that the lime and sulfur mixture be applied at a temperature between 105° and 110° F. to secure the best result.

(*f*) The number of applications necessary is governed by the extent of the infection. A single dipping will usually destroy the parasites on a contact animal. In the treatment of infected animals repeated applications are usually required to secure the penetrating effect of the parasiticide and the only rule to be followed is to continue applications until all evidence tending to show the presence of parasites has disappeared. The usual interval between applications is 7 days. The possibility of recurrence from deep-seated lesions not affected by the treatment and of reinfection must be constantly borne in mind.

284. Shipping fever (AR 40-2115).—Under this general heading is included a group of infectious diseases usually incident to the shipment of horses and mules. In this group are found three separate conditions—influenza, contagious pneumonia, and strangles.

a. Cause.—Diseases in this group are usually the result of direct contact with animals already in the early stages of the disease or from contact with infected stables, sales barns, stockyards, cars, etc. Long railroad journeys, excitement, and irregular feeding and

watering tend to lower the animals' resistance and the disease is rapidly spread.

b. Preventive measures.—(1) Every effort should be made to improve conditions under which newly purchased animals are handled. Disinfection of stockyards, stables, pens, cars, watering troughs, and feeding places are absolutely essential. The early and frequent taking of temperatures with prompt removal of sick animals from shipments is necessary.

(2) Only sufficient feed for one feeding should be placed in the racks at feed stations and any portion of a feed which may be left should be promptly removed.

c. Symptoms.—The first symptoms noticed are loss of appetite, depression, and great weakness. There is a definite rise of the temperature, the eyes are often intensely inflamed, and there is frequently a discharge from the nostrils which may be watery at first, later becoming thicker and often tinged with yellow. At first there may be constipation, to be followed by diarrhea. In strangles there is usually a swelling of the submaxillary lymph glands.

d. Treatment.—Absolute rest. Clothe the animal according to the season. Provide plenty of fresh, clean, drinking water and provide soft palatable foods. The condition may be complicated by the appearance of colic, which may be relieved by the administration of *Cannabis indica*, fluid extract of belladonna, camphor, or other indictated medication. Give 15-gram doses of potassium nitrate in the drinking water 2 or 3 times a day. The enlarged glands of strangles cases should be treated with stimulating liniments and hot applications. As soon as fluctuation is noticed, the glands are lanced and irrigated twice daily with an antiseptic solution. Animals should be fed on the ground to prevent the discharge of abscesses from entering the stomach or lungs. The isolation of sick animals is essential.

285. Dermatitis gangrenosa.—An infectious disease affecting the skin of the lower extremities, causing destruction and deep sloughing of the tissues.

a. Cause.—This disease is caused by a specific organism, *Actinomyces necrophora*, which lives in the soil and filth. The infection enters the tissues through skin macerated by continued moisture, wounds from nails, wire cuts, sharp cinches, etc., and is common to muddy corrals and dirty picket lines.

b. Symptoms.—Lameness, sloughing, and ragged, gangrenous wounds in the region of the ankles, pasterns, and coronet, sometimes involving the sensitive laminae of the foot; the center of the wound is

filled with a soft mass of decomposed tissue which is easily detached with the forceps, leaving a raw, irregular surface with the skin underrun and ragged.

c. Prevention.—(1) This condition with its resulting complications has been one of the chief causes of animal disability, and in localities where the soil is known to harbor the organism, close attention to the condition of the feet is essential. Animals required to work in mud and filth should be carefully groomed twice daily, special attention being given to the feet and fetlocks. Wounds of every description must be promptly treated and the patient provided with a dry place to stand. Long hairs are nature's best protection, and clipping the fetlocks in fall, winter, and spring is decidedly objectionable.

(2) It is essential that dry standings be provided. Fence off or fill in wet places. When it becomes apparent that the soil of a corral is infected with the organism of the disease, it should not be further used if other space is available. Wholesale chemical disinfection of large areas is without value. In small areas the top layer of mud and manure can be removed and the surface given prolonged exposure to the sun.

d. Diagnosis.—The typical necrosis and rapid development of new cases is usually sufficient to establish the diagnosis but tissue specimens should be sent to a laboratory for confirmation, care being taken to obtain specimen from deep tissue.

e. Control.—All cases of this disease should be promptly separated from well animals and segregated as far as possible. Prompt and energetic surgical treatment is indicated. Careful nursing and attention to the general condition of the animal are essential.

286. Equine encephalomyelitis.—This is an infectious disease of horses and mules characterized by derangement of consciousness, distinct nervous symptoms, loss of appetite, paralysis, and great debility.

a. Cause.—The disease in the United States is caused by two immunologically different filtrable viruses. One is termed the "Eastern" type, the other the "Western" type. Up to the present time all cases of the disease which have occurred West of the Appalachian Mountains have been found to be due to the "Western" type virus, whereas those east of the Appalachians have been caused by the "Eastern" type virus.

b. Symptoms.—The first symptom of this disease is an elevated temperature, which may go as high as 105° or 106° F. There is inappetence, depression with a decided lack of spirit, and, initially, a reluctance to move. The disease may then take on one of two characteristics—a so-called "sleepy" type or a "walking" type. In the

"sleepy" type the animal drowses and will move only when urged to do so. Frequently it will stand with its head pressed against the wall of the stall. In the "walking" type the animal, as long as it is able to do so, will move more or less continuously, usually following the fence if in a corral or paddock. Animals are noted to yawn frequently, may drool saliva, and grind their teeth. As the disease advances the gait becomes wobbly, swallowing becomes increasingly more difficult and finally cannot be accomplished at all. The respiration is increased and nervous symptoms become marked, finally ending in convulsions. If the disease is prolonged more than a very few days there is rapid emaciation.

c. Prevention.—Affected animals should be isolated in screened stables and biting insects should be controlled through the use of appropriate insecticides. Animals not at work should be kept out of pastures, etc., where mosquitoes are prevalent. Stables should be screened or darkened. Strict anti-mosquito measures should be enforced. Strict sanitary precautions are essential and dead animals should be burned or properly buried. Military animals in the field may be protected from bites of mosquitoes and other insects by smudging picket line areas. Successful immunization against this disease is accomplished through the administration of two doses of vaccine prepared from chick embryos in which the virus is propagated. This vaccine has proved highly efficacious and should be used prior to the beginning of the mosquito season. It is very essential that vaccine prepared from virus of the particular type common to the locality be utilized. Where animals are likely to be moved back and forth between areas in which the two different types of virus are encountered it is essential that they be immunized against both types.

d. Treatment.—The application of early symptomatic treatment is essential. Quiet, cool, comfortable quarters with abundant bedding to prevent injury should be provided for animals which are down. If possible animals should be supported in slings or preferably well padded frames. Access to fresh water should be had at all times and small quantities of specially prepared foods should be available if the animal will eat. Where the pharynx is paralyzed, it is necessary to give by stomach tube large quantities of water to which may be added gruels and blackstrap molasses. The administration of medicine by drenching is to be avoided. Glucose and large doses of physiological saline solution intravenously are of value. The use of large doses of 200 to 300 cc. of specific antiencephalomyelitis serum intravenously is indicated. This should be repeated several times according to indications.

287. Tetanus.—*a. Cause.*—Tetanus is an infectious disease caused by a bacterium found in soil, manure, and in manured ground (gardens and stables). The germ enters the body through wounds, and animals sustaining deep punctured wounds which become soiled with earth or manure are likely to develop the disease. Punctured wounds of the feet are especially dangerous, particularly when allowed to close too soon. This germ does not grow in the presence of air and, therefore, is not common in large, open wounds.

b. Symptoms.—(1) Usually develop in about 7 days following injury. The first symptom noticed is a slight general muscular stiffness which interferes with movement, chewing, swallowing, and drinking. In a short time the stiffness increases, the head is held extended, the tail is elevated, and the ears are held erect. Eating becomes more and more difficult or impossible and food and saliva collect in the mouth and decompose. The muscles become firmly contracted and hard; the jaws are set; the nostrils are dilated and the limbs are greatly stiffened and braced well apart. If the animal is forced to move, the legs are carried like stilts, with little or no bending of the joints.

(2) There is muscular twitching and excitement, both of which are increased by any sudden noise, a flash of light, or a slap of the hand.

(3) The eye is drawn well into its socket and the membrana nictitan partially covers the eyeball. There may be profuse sweating. Temperature is at first normal or slightly elevated. Later it may rise to 105° or over.

(4) In cases which develop early, death may occur in from 1 to 3 days, the average duration of fatal cases.

c. Prevention.—This disease is entirely preventable by giving the animal a preventive dose of tetanus antitoxin as soon as possible after the wound is inflicted. As a general rule it is advisable to give this preventive inoculation to all animals which receive a penetrating wound of the foot, or after any wound when the depth of the wound or contamination by soil or manure indicates the possibility of infection. The inoculation is given subcutaneously in the same dosage (1,500 units) as that used for man.

d. Treatment.—Isolate the animal in a quiet, darkened stall where he will be free from anything that may excite him. Any wounds that can be found should be thoroughly disinfected with tincture of iodine. The diseased animal is not a menace to other animals, as the disease cannot be transmitted directly, except through wound infection from discharges from an infected wound. Feed gruels or thin

mashes and keep water in front of the animal at all times. Antitetanus serum is of little value after symptoms have developed. Do not annoy the animal by frequent observation; absolute quiet is the best treatment. Diseased animals that live as long as 10 days usually recover.

288. Botulism (forage poisoning).—*a. Cause.*—Botulism is an acute specific intoxication characterized by a marked disturbance of the central nervous system and is caused by the toxin of *Clostridium botulinum.* The intoxication is acquired through the ingestion of food and water containing the causative agent.

b. Symptoms.—Animal presents a staggering gait, muscular weakness, and paralysis which is rapidly progressive, terminating in death in from 4 hours to 3 or 4 days. Paralysis of the throat may occur and the tongue may hang from the mouth.

c. Treatment.—Large doses of polyvalent antitoxin are of some value when administered early in the course of the disease. The animal should be supported by slings if possible. Food and water should be changed to prevent further ingestion of suspected food. Medication should be administered by stomach tube or hypodermically. Grass and specially prepared gruels should be fed. Some years ago botulism was considered to be a quite prevalent disease among horses. It is now evident that many of the cases previously diagnosed as botulism were in reality cases of encephalomyelitis of virus type. Further, there occur forms of "forage poisoning" other than that caused by the toxin of *Clostridium botulinum.* Thus, in the light of more recent information, it is apparent that botulism among horses is not nearly so common as was believed to be the case in the past.

289. Anthrax.—*a. Cause.*—Anthrax is an acute infectious disease of man and animals caused by the *Bacillus anthracis.*

b. Symptoms.—The disease is characterized by depression, weakness, difficult respiration, cyanotic mucous membranes, and bloody diarrhea. Sometimes edematous swellings occur in the pendulant and lumbar regions.

c. Diagnosis.—(1) Microscopically by examination of a drop of blood in animals in the late stages of the disease. In early cases it is very difficult to find the organism in the blood stream. After death the organism can be demonstrated in the blood and various organs of the body. The characteristic lesions are the dark red blood which does not clot, sero-gelatinous condition of the connective tissues, hemorrhages on the internal organs, enlargement of the spleen, the parenchymatous tissue of which is dark red and semi-fluid.

(2) Because of the great danger of the transmission of this disease to individuals doing autopsies, necropsies should not be made of cases in which the diagnosis has been already established. Further, as the spore of the anthrax organism is one of the most resistant forms of bacterial life known, the contamination of autopsy rooms or the ground where animals dead of anthrax are opened is exceedingly difficult to overcome.

d. Transmission.—Usually by the ingestion of food or water containing the infective organism. It is frequently termed a pasture disease because it is commonly contracted during grazing on infected pastures. Humans are usually infected from handling infected animals or hides.

e. Prevention and treatment.—(1) Animals should be kept from infected areas and upon appearance of the disease in the vicinity of Army posts Government animals should be immunized through the use of one of the several types of biological products which are available.

(2) Affected animals should be immediately destroyed and their carcasses preferably burned.

(3) A thorough disinfection of the stable and any objects which may have been in contact with infected animals is important.

(4) Animals suspected of being in the incubative stage of the disease may be given anti-anthrax serum and this later followed by vaccination. All contacts should be placed in absolute isolation.

Chapter 6

ADMINISTRATION

Section I

CLERICAL RECORDS AND REPORTS

290. Clerical records and reports.—Below are listed some of the forms in common use.

a. W. D., A. G. O. Forms.

No.	Title and description
1	*Company Morning Reports.*—One copy. A permanent record prepared by the commanding officer of the company or detachment and submitted to the commanding officer of the regiment, separate or detached battalion, or similar unit and in the case of separate or detached companies, to the commanding officer of the next higher administrative unit, or of the post, camp, or station. See AR 345–400.
2	*Headquarters Morning Reports.*—One copy. A permanent record provided for the purpose of accounting for officers and enlisted men not belonging or attached to a company or to a detachment using a Company Morning Report, and for Army nurses, warrant officers, and contract surgeons. See AR 345–400.
5	*Daily Sick Report.*—One copy. A permanent record prepared by the commanding officer of a company or detachment and sent to the place of holding sick call by the noncommissioned officer in charge and returned by the same means to organization. See AR 345–415.
6	*Duty Roster.*—One copy. List of officers or enlisted men by name that is kept for the purpose of recording duty performed by each person. See AR 345–25.

No.	Title and description
9	*Monthly Roster.*—Four (or more) copies. Prepared monthly or at certain other intervals, such as on the day the command is organized, reorganized, demobilized, or rendered inactive. Normal disposition of copies as follows: Original to The Adjutant General, one copy to the chief of the arm or service concerned, one copy to the headquarters of the corps area, and one copy retained for file. See AR 345-900.
13	*Report of Enlistments.*—One copy. Prepared and forwarded to The Adjutant General by the recruiting officer. See AR 600-750.
15	*Report of Survey.*—Whenever loss or destruction of, or damage to public property occurs, the responsible officer will accomplish W. D., A. G. O. Form No. 15 in triplicate within 30 days, unless prevented by explained exceptional circumstances, and send all copies to the commanding officer or appointing authority for approval, disapproval, or such other action as he may deem pertinent. After action by appointing authority, the original and one copy are forwarded to the corps area commander and the third copy to the accountable officer. See AR 35-6640.
21	*Enlistment Record, Regular Army.*—One copy. Prepared by the recruiting officer for every soldier enlisted, and forwarded to The Adjutant General. See AR 600-750.
23	*Report of Enlisted Men Enlisted for, Reenlisted in, or Transferred to certain Arms or Services.*—One copy. Prepared by the commanding officer of the company or detachment upon receipt of soldier's service record. Sent to the chief of the arm or service concerned. Fact of mailing with date should be entered under remarks in the service record. See AR 600-750.
24	*Service Record.*—One copy. Prepared by the recruiting officer. Accompanies soldier until end of his enlistment. Then sent to The Adjutant General by the commanding officer of the company or detachment to which the soldier belongs. See AR 345-125.
24-1 to 24-7, incl.	*Insert to Service Record.*—Furnished to record data, when the space alloted in the service record is insufficient. See AR 345-125.
25	*Extract from Service Record.*—One copy. Prepared by the custodian of the service record upon desertion, transfer, individual change of station, etc. It is filed with the records of the unit. See AR 345-125.
26	*Assignment Card.*—One copy. Prepared by the commanding officer of the company or similar organization upon the receipt of an order assigning or transferring an enlisted man to his command. Forwarded to The Adjutant General. See AR 615-200.
29	*Authorization for Allotment of Pay.*—Two copies. Original mailed by the commanding officer of the unit to the Finance Officer, United States Army, Washington, D. C. See AR 35-5520.
29-1	*Authorization for Change of Allotment.*—Two copies. Same remark as above. See AR 35-5520.

No.	Title and description
29-2	*Authorization for Deduction of Pay.*—Two copies. Original mailed by the commanding officer of unit to the Director of Insurance, Veterans' Administration, Washington, D. C. Duplicate retained for file. See AR 600-100.
30	*Notification of Discontinuance of Allotment or Deduction.*—Two copies. This is a double form—Discontinuance of Allotment printed on one side and Discontinuance of Deduction on the other. Same procedure as for W. D., A. G. O. Forms Nos. 29 and 29-2 respectively. See AR 35-5520 and AR 600-100.
30-1	*Notification of Reinstatement or Suspension of Allotment.*—Two copies. This is a double form—Notification of Reinstatement on one side and Notification of Suspension on the other. Same procedure as for W. D., A. G. O. Form No. 29. See AR 35-5520.
31	*Furlough.*—Two copies. Original sent to headquarters for signature of the commanding officer. Not delivered to soldier until expiration of furlough, then signed by company or detachment commander to certify date of return. Both copies sent to Finance Officer for payment of furlough ration money. See AR 615-275.
32	*Individual Clothing Record.*—One copy. In case of transfer, accompanies soldier. True copy made and retained for file. See AR 35-6680, 35-6720, and 615-40.
33	*Individual Equipment Record.*—One copy. See AR 35-6680, 35-6720, and 615-40.
35	*Individual Clothing Slip.*—Two (or more) copies. Used in the issue of clothing to individual enlisted men and in the transfer of accountability for individual equipment in their possession upon change of station. See AR 35-6560, 35-6680, and 615-40.
36	*Statement of Charges.*—Three copies. Prepared by the commanding officer of the company or detachment. Original to the accountable officer; one copy to the responsible officer; and one copy retained for file. A separate Statement of Charges will be made for property of each supply branch. See AR 35-6620, 35-6640, and 345-300.
38	*Report of Physical Examination of Enlisted Man Prior to Discharge or Retirement.*—Two copies. Prepared by commanding officer of the company or detachment, signed by the soldier concerned. Sent to the surgeon for physical examination of the soldier. Returned to the commanding officer of the company or detachment who transmits the original to The Adjutant General with service record. One copy retained for file. See AR 40-100.
39	*Notification of Discharge.*—One copy. Prepared by the officer who prepares the final statement and sent to the disbursing officer who is to pay the account. Used in case there is not any finance officer located where the soldier is discharged. See AR 345-465.

No.	Title and description
40	*Certificate of Disability for Discharge.*—Three copies. Prepared by company commander. Sent to the board of medical officers through the officer convening the board, then to the corps area commander. The original is returned to the company commander, who, after discharging the soldier, sends it to The Adjutant General. See AR 600–500, and 615–360.
41	*Designation of Beneficiary.*—One copy. Prepared by company or detachment commander and sent to The Adjutant General. Prepared in case of change of beneficiary subsequent to enlistment. See AR 600–600.
42	*Change in Address of Beneficiary or Next of Kin.*—One copy. Same remarks as above. See AR 600–600.
44	*Report of Desertion.*—Four copies. Prepared by the commanding officer of company or detachment. Original and two copies forwarded to The Adjutant General with service record. Copy retained for file. See AR 615–300.
46	*Report of Apprehension or Surrender of a Deserter.*—Three copies. Prepared by the commanding officer of the company or detachment. All copies sent to The Adjutant General, who pastes the original in the service record, which is returned to the commanding officer of the post, camp, or station at which the deserter is in confinement. See AR 615–300.
49	*Application for Retirement.*—Two copies. Signed and submitted by the soldier to his organization commander who in turn forwards it to The Adjutant General through the post or regimental commander, with information in his indorsement as to whether or not soldier has lost any time under AW 107 during his current enlistment. See AR 615–395.
52	*Report of Death.*—Three copies. Prepared by the surgeon or by the soldier's immediate commanding officer if medical officer is not present or available, in which case it is also signed by a civilian physician. Original and one copy to The Adjutant General. One copy retained for file. A fourth copy will be forwarded to soldier's commanding officer when death occurs away from home station or post. See AR 600–550.
54	*Inventory of Effects.*—Three copies. (See AW 112.) Prepared in the case of every person whose effects are under the control of the military authorities. See AR 600–550.
55	*Honorable Discharge from the Army of the United States.*—One copy. Prepared and signed by the commanding officer of the company or detachment and presented to a designated field officer or the commanding officer of the post, camp, or station for his signature. Given to the soldier who must present it to the finance officer paying final statement for notation as to fact of payment. See AR 345–470.
56	*Discharge from the Army of the United States (blue).*—One copy. Same remarks as above. See AR 345–470.

No.	Title and description
57	*Dishonorable Discharge from the Army of the United States* (*yellow*).—One copy. Same remark as above, with the exception that discharge is not delivered to soldier until his release from confinement. See AR 345-470.
63	*Report of Physical Examination.*—One copy. Used for the annual physical examination of all officers, warrant officers, and members of the Army Nurse Corps. Used to record the physical examination of the above personnel prior to discharge, dismissal, or resignation and at certain other intervals, such as promotion. See AR 40-100 and 40-105.
64	*Physical Examination for Flying.*—Two copies. Forwarded directly to the Chief of the Air Corps, who approves or disapproves them and returns one copy to the station for the file of the flight surgeon. Used to record the physical examination of candidates for commission in the Air Corps and the transfer of officers thereto. Used for January and July examination of all pilots and rated observers. See AR 40-110.
73	*Basic Strength Return.*—Four copies. Rendered by the commanding officer of each branch of the service represented at a post. Original to The Adjutant General. Copy to the chief of the branch. Copy to the corps area concerned and copy retained for file. See AR 345-50, 345-55, and 345-100.
115	*Charge Sheet* (*for Courts Martial*).—Three copies. Any person subject to military law may prefer charges. After preparation they are signed and affidavit completed as prescribed by AW 70. All copies are submitted to the commanding officer for investigation and such action as he deems appropriate in each case. If tried by summary court-martial the three copies are disposed of as follows: The original copy is filed at post headquarters, a copy sent to The Adjutant General and a copy to the officer exercising general court-martial jurisdiction. See paragraph 31 and appendix 3, Manual for Courts Martial.
181	*Enlistment record, Regular Army Reserve.*—Three copies. Accomplished by the recruiting officer or other officer authorized to accept enlistments for the Regular Army Reserve. The original copy (white) is sent to the commanding general of the corps area in which the reservist's home is located. The second copy (pink) is sent to The Adjutant General. The third copy (green) is given to the reservist. See AR 155-5.

b. F. B. I. Military Fingerprint Card.—One copy. Prepared by the recruiting officer or other officer designated for the purpose for every soldier enlisted, and forwarded to The Adjutant General. See AR 345-120.

c. W. D., M. D. Forms.

No.	Title and description
16a	*Issue slip—Expendable Medical Property.*—Made out and signed by the officer in charge of ward or department. Names of articles desired will be written as they appear in the Medical Department Supply Catalog. Slip will be completed by the officer in charge, who will insert the date and receipt same. Filed at the medical supply office. See AR 40–1705.
16b	*Issue Slip—Nonexpendable Medical Property.*—Made out and signed in duplicate by the officer in charge of the ward or department. Names of articles will be written as they appear in the Medical Department Supply Catalog. Both the original and duplicate slip will be completed by the receipt of the officer in charge, who will insert the date. Original will then be filed at the medical supply office and the duplicate returned to the requesting officer for file with his retained memorandum receipt. See AR 40–1705.
16c	*Credit Slip—Nonexpendable Medical Property.*—Made out and signed in duplicate by the officer in charge of the ward or department where the property has been in use. Names of articles will be written as they appear in the Medical Department Supply Catalog. If property to be turned in is unserviceable from any cause other than fair wear and tear in the military service, a statement to that effect will be attached showing what action has been taken to fix responsibility. Both the original and duplicate slip will be completed by the receipt of the storekeeper, who will insert the date. The original will then be returned to the officer turning in the property for file with his retained memorandum receipt, and the duplicate will be filed at the medical supply office. See AR 40–1705.
16d	*Exchange Slip—Nonexpendable Medical Property.*—Made out and signed by the officer in charge of the ward or department for which the serviceable property is needed. Names of articles desired will be written as they appear in the Medical Department Supply Catalog. If property to be turned in is unserviceable from any cause other than fair wear and tear in the military service, a statement will be attached showing what action has been taken to fix responsibility. The slip will be completed by the receipt of the officer in charge, who will insert the date. It will then be filed at the medical supply office. See AR 40–1705.
21	*Hospital Laundry List.*—Copy sent to The Surgeon General, with the voucher for laundry service in case the service is being accomplished by a civilian laundry. A copy sent to The Surgeon General as a monthly report in case the service is being accomplished by a Government-owned laundry. One copy retained. See AR 40–590.

No.	Title and description
42	*Contract for Laundry Work* (with appendix sheet "A").—Six copies. Three copies sent to The Surgeon General or corps area surgeon for approval. Three authenticated copies prepared and distributed as follows: One copy for the contracting officer, one to the Returns Officer, General Accounting Office, and one to the disbursing officer. See AR 5–160, and 40–590.
49	*Statement of the Hospital Fund.*—Two copies. Original to The Surgeon General through the corps area surgeon. Retained copy for file. See AR 210–50.
49a	*Employee's Certificate of Indebtedness for Hospital Service.*—Three copies. Marked "Original", "Duplicate", and "Triplicate." Two copies to the officer under whom the employee is serving. One copy retained by the commanding officer of the hospital. See AR 40–590.
51	*Report Sheet for Report of Sick and Wounded.*—Two copies. Original with report cards and other records to the corps area surgeon for checking and then forwarded to The Surgeon General. Copy filed. See AR 40–1025.
52	*Register Cards.*—Two copies. Original to the corps area surgeon along with W. D., M. D. Form No. 51. Copy filed. See above and AR 40–1025.
52a	*Index Record of Patients* (*Card*).—Register index. One copy. Kept in the hospital and prepared by all hospitals in peace or war, wherever located. Also used for keeping the "diagnosis index" and other indices at fixed hospitals in addition to its use as a nominal index of patients. See AR 40–1025.
52b	*Emergency Medical Tag.*—Used only in the field. Two copies. Original attached to all sick, wounded, and dead, as soon as practicable. See FM 8–45.
52c	*Field Medical Card.*—One Copy. Started at the first hospital in the field where treatment is furnished. Accompanies the patient until return to duty, death, or arrival in zone of the interior. Removed and sent with the monthly report of sick and wounded to the chief surgeon, or corps area surgeon, as the case may be, for transmittal to The Surgeon General. See FM 8–45.
52d	*Field Medical Record Jacket.*—For field use. Used for inclosing the field medical card, emergency medical tag, and any other clinical record of value. See FM 8–45.
54	*Surgeon's Request for Service Record.*—Used by the commanding officer of hospital to make direct call upon the proper organization commander for the soldier's service record in the event of failure to receive same in due time. See AR 40–590.
55a	*Clinical Record Brief.*—A clinical record will be kept by fixed hospitals in time of peace or war, excepting those serving in a theater of operations. This form and 55j are used for every patient treated in hospital and for serious cases treated in quarters. See AR 40–1025.

NOTE.—The other lettered blanks of the 55 series will be used as the nature or importance of the case may warrant.

No.	Title and description
56	*Malarial Register.*—One copy. Prepared for every case or carrier of malaria and should be kept up to date until patient is definitely cured or terminates his military service. In the event of transfer, accompanies the patient to his new station. In the event of termination of his military service, will be sent to The Surgeon General. See AR 40–230.
57	*Report of Dental Service.*—Rendered monthly from every station and separate command where a dental officer has been on duty during the month. If post is under the immediate control of the War Department, report is sent direct to The Surgeon General. One copy retained. If forwarded through the corps area surgeon, two copies are forwarded and one retained. See AR 40–1010.
59	*Report of Examination for Sergeant, Staff Sergeant, Technical Sergeant, or Master Sergeant, Medical Department.*—One copy. See AR 615–15.
71	*Surgeon's Morning Reports of Sick.*—Signed each day by the medical officer responsible for its rendition. Promptly forwarded to the organization commander who will enter the strength of the command. See AR 40–1005.
72	*Morning Report of Ward.*—Rendered each morning by ward officer. Sent to the registrar along with clinical records, etc., of completed cases. Not a permanent record. See AR 40–590.
72a	*Consolidated Morning Report of Wards.*—Kept by the Registrar of the hospital. See AR 40–590.
73	*Diet Card.*—Made out daily by the ward officer and sent to the hospital mess. Not a permanent record. See AR 40–590.
74	*Mess Account.*—Kept by noncommissioned officer in charge. Filed at the end of every month with retained hospital fund papers for that month. See AR 40–590.
75	*Patient's Property Card.*—Made out in duplicate. Original filed with hospital records; duplicate given to patient. See AR 40–590.
76	*Patient's Property Tag.*—Used for identification of patient's property. See AR 40–590.
77	*Venereal Prophylaxis Slip.*—Record of prophylactic treatment. Authenticated daily by the initials of the officer in charge of prophylactic station. May be destroyed after 3 months. See AR 40–235.
78	*Syphilitic Register.*—Maintained for each person in active military service who has syphilis. Kept on file in the office of the surgeon. On "cure" or separation from the service, the register will be forwarded to The Surgeon General. See AR 40–235.
79	*Register of Dental Patients (Card).*—Made for every person admitted to a dental clinic for dental treatment. See AR 40–1010.

No.	Title and description
81	*Immunization Register.*—Made out in duplicate. Original in cases of officers, warrant officers, and nurses to the person concerned. Original in cases of enlisted men to the organization commander for entry on soldier's service record. Duplicate copy will be filed in an alphabetical immunization file of the medical department records of the station or command to which the individual belongs. See AR 40-215.
86ab	*Statistical Report* (first and second sections).—Rendered by the surgeon of every separate station or command. Made out in triplicate. See AR 40-1080.
86c	*Statistical Report* (third section).—See above remarks.

d. W. D., Q. M. C. Forms.

No.	Title and description
22	*Statement of Clothing Charged to Enlisted Men.*—One copy. Used by company commanders to list the names and amount charged to clothing allowance of men to whom clothing has been issued. Sent to officer designated for keeping service records. See AR 35-6560, 35-6720, and 615-40.
364	*Weekly Collection and Delivery Sheet.*—Three copies. Shows names of each enlisted man sending laundry. Original and duplicate to laundry each week; triplicate retained for file. See AR 30-2135.
365	*Monthly Roster and Statement.*—Three copies. Shows names of enlisted men of the organization who have signified intention to have quartermaster laundry service during the month. Original and duplicate to laundry on first day of month; triplicate retained for file. See AR 30-2135.
374	*Enlisted Men's Laundry Slip.*—One copy. A list of laundry sent by enlisted men to accompany each bundle. Sent to laundry. See AR 30-2135.
400	*Requisition.*—Three copies. Used in requisitioning all supplies except those for which special forms are provided. Original and duplicate to commanding officer for approval and in turn to quartermaster for issue. Triplicate retained. See AR 35-6540, and 35-6720.
409	*Requisition and Receipt for Clothing in Bulk.*—Three copies. Normally submitted by organization quarterly for clothing charged against clothing money allowance. Original and duplicate to commanding officer for approval and in turn to quartermaster for supply. Triplicate retained for follow-up purposes. See AR 35-6540, 35-6560, and 35-6720.

No.	Title and description
411	*Requisition and Receipt for Brooms, Brushes, Matches, Mops, Toilet Paper, Soap, etc.*—Three copies. Quarterly requisitions by organizations for items appearing thereon but not exceeding in money value of budget credit allotted to organizations. Original to commanding officer for approval and in turn to the quartermaster for supply. Triplicate retained. See AR 30-3010, 35-6540, and 35-6720.
412	*Requisition and Receipt for Stationery and Office Supplies.*—Three copies. See remarks about W. D., Q. M. C. Form No. 411.
413	*Requisition and Receipt for Cleaning and Preserving Materials.*—Three copies. See remarks about W. D., Q. M. C. Form No. 411.
414	*Requisition and Receipt for China and Glassware.*—Three copies. See remarks about W. D., Q. M. C. Form No. 411.
424	*Stock Record Card for Loose Leaf Binder, Organizations or Posts and Stations.*—One copy. Used for keeping stock records. See AR 35-6560 and 35-6720.
431	*Receiving Report.*—Three copies. Used as voucher to stock record account to cover receipt and acceptance of articles purchased. Original and duplicate to finance officer designated to make payments. Retained copy, voucher, to stock records. See AR 35-6560 and 35-6720.
434	*Shipping Ticket.*—Five copies. Used when property accountability is transferred from one accountable officer to another. Original and duplicate to consignee, who, upon receipt of property, will sign one copy and return to consignor. Third and fourth copy to finance officer of the corps area where consignee is located. Retained copy, credit voucher, to stock record account of consignor. See AR 35-6560 and 35-6720.
445	*Over, Short, and Damaged Report.*—Three copies. See AR 35-6560, 35-6640, and 35-6720.
460	*Ration Return.*—Three copies. A requisition on the quartermaster for rations. Signed and submitted by officers under whom persons entitled to these are serving. After approval by the commanding officer, original and duplicate sent to quartermaster sales officer. Third copy retained. See AR 30-2210 and 35-6720.
487	*Memorandum Receipt.*—Three copies. Used by accountable officer who issues property to individual or organization who in turn assumes responsibility used as credit or debit voucher to memorandum receipt account. Original and duplicate to organization or individual to whom property was issued, who will sign original and return to accountable officer. Retained copy used for follow-up purposes. See AR 35-6520 and 35-6720.
488	*Account of Property on Memorandum Receipt.*—One copy. Used by property officer to show where property is located for which he is accountable. Postings are made from W. D., Q. M. C. Form No. 487. See AR 35-6520 and 35-6720.

e. W. D., I. G. Forms.

No.	Title and description
1	*Inventory and Inspection Report.*—Responsible officer will prepare and sign two copies, listing the property to be inspected. Action of the inspector will be final. See AR 20-35.
2	*Inventory and Inspection Report of Public Animals.*—Unserviceable public animals will be listed on this form. Prepared whenever needed. See AR 20-35.

SECTION II

MILITARY HOSPITALS

291. General.—The fundamentals set forth below officially govern the administration of Army hospitals. They cover chiefly the administration of general and the larger station hospitals. Insofar as applicable and practicable they have equal force in the administration of all fixed hospitals, irrespective of their type or capacity. Local conditions will require commanders in the theatre of operations to make certain changes. For further information on this general subject see AR 40-245, 40-580, 40-585, 40-590, 40-600, 40-605, and 40-610.

292. Titles applicable to duty personnel.—The following titles are given the Medical Department personnel performing the more important administrative and clinical duties at a hospital.

Duty	Title
Commanding hospital	Commanding officer.
In charge of a service	Chief of ______ Service.
Commissioned assistant on a service	Assistant ______ Service.
Officer in charge of records of sick and wounded.	Registrar.
Officer in charge of a ward	Ward officer.
Commissioned assistant in a ward	Assistant ward officer.
Nurse in charge of nurse staff	Chief nurse.
Nurse in charge of a ward	Head nurse.
Principal enlisted assistant in a ward	Wardmaster.
Other enlisted assistant in a ward	Ward attendant.

293. Duties of commanding officer.—*a. General.*—The commanding officer of a hospital is responsible for its proper discipline and administration, including the care and preparation of the necessary reports, registers, and records, as well as for the care and safeguarding of all public property which may come into his possession; for the proper expenditure of supplies and funds; and for the preparation of requisitions, returns, and payrolls of the hospital. The commanding officer is responsible for the military and technical training of all elements of his command. This includes the preparation of training schedules, the maintenance of records, and the supervision and coordination of the necessary training inspections. While not charged with the execution of duties delegated by him to an assistant, he is responsible for exercising such supervision over these duties as to insure their prompt and efficient performance by the designated subordinate.

b. Patients.—(1) The commanding officer (or one of his commissioned assistants) determines what patients are to be admitted or discharged from the hospital. He provides for their assignment to wards or subdivisions according to the nature of their complaints and is responsible for supervising their care and treatment, including the employment of recognized professional procedures.

(2) The commanding officer or a commissioned assistant designated by him commands the detachment of patients.

(3) Information concerning the condition of sick and wounded patients necessary to allay the anxiety of friends may be imparted under instructions of the commanding officer.

(4) When in the opinion of the commanding officer of the hospital the condition of a patient, by reason of injury or disease, has reached a stage which seriously endangers life, the commanding officer promptly communicates the fact (by telegraph or otherwise, as he may deem necessary) to the person designated by the patient to be notified in case of emergency. In such cases the commanding officer also notifies the local Army chaplain.

c. Claims and vital statistics.—For regulations relating to the furnishing of information which can be made the basis of a claim against the United States, see AR 35-7020. For regulations regarding reports of births, deaths, and cases of communicable diseases, see AR 40-1025 and 40-1080.

d. Duty personnel.—The commanding officer (or one of his commissioned assistants) commands as a detachment commander all duty personnel under his jurisdiction. He assigns them to appropriate duties, and reports them on the proper returns in the capacity in which they are serving. He requires a proper performance of duty by the entire hospital personnel and prescribes and enforces proper regulations as to the sanitary, disciplinary, and other requirements of the hospital. His responsibility for training has been noted in *a* above.

e. Inspections.—Depending on the size of the hospital, the commanding officer inspects or directs the inspection of the entire hospital daily, and on Saturdays inspects, or causes to be inspected, the Medical Department detachment.

f. Use of hospital buildings.—(1) The commanding officer of a hospital is responsible that no portion of the hospital buildings is occupied as quarters or used for maintaining a mess, except for patients and for personnel of the Medical Department (including civilian employees) on duty thereat.

(2) Quarters and messes for officers on duty at the hospital may be permitted in rooms or buildings of the hospital set aside for the purpose, only when deemed necessary by the commanding officer of the hospital concerned.

(3) When in the opinion of the commanding officer of the hospital it is impracticable for officers on duty at the hospital to maintain private messes, such officers may be subsisted in one of the established hospital messes, paying into the hospital fund for their subsistence an amount equal to that prescribed for officer patients in the same hospital, plus 25 cents a day.

g. Fire control.—The commanding officer is responsible for instituting proper measures for the prevention and control of fire. These measures include the enforcement of fire-prevention measures prescribed by higher authority, the appointment of a competent fire marshal, the formulation of adequate regulations for fire prevention, periodic fire drill, etc.

h. Reports, records, and returns.—The commanding officer is responsible for the proper and timely rendition of all reports and

returns pertaining to his hospital and the official records thereof. See AR 40-1005.

i. Services.—(1) *General.*—For convenience of administration, and in the interest of professional efficiency, the commanding officer of each Army hospital organizes the professional and other activities of his hospital into services after the manner of well-organized hospitals in civil communities. He prescribes the number of services for his hospital, the lines of control over them, and their relationship to each other.

(2) *List.*—The following list, arranged alphabetically, represents the services customarily established in large hospitals, though considerable variation therefrom is left to the discretion of the commanding officer of the hospital concerned, who may create additional services under appropriate titles when a necessity therefor exists:

Administrative.	Nursing.
Dental.	Orthopedic.
Eye, ear, nose, and throat.	Physical reconstruction.
Laboratory.	Roentgenological.
Medical.	Surgical.
Neuropsychiatric.	Urological.

294. Administrative service.—*a. Personnel and activities.*—The administrative service of a fixed hospital includes such personnel and activities as the commanding officer of the hospital may prescribe. Personnel and activities as follows properly belong in the administrative service:

(1) *Personnel.*

(*a*) Commanding officer.

(*b*) Executive officer.

(*c*) Adjutant.

(*d*) Personnel officer.

(*e*) Registrar (including commander of detachment of patients).

(*f*) Officer of the day.

(*g*) Chaplain.

(*h*) Chief nurse.

(2) *Activities.*

(*a*) Admission and discharge of patients.

(*b*) Hospital inspection.

(*c*) Detachment, Medical Department.

(*d*) Hospital mess.

(*e*) Fire control.

(*f*) Summary court.

(*g*) Recruiting.

(*h*) Post exchange.

(*i*) Training of detachment.

b. Registrar.—In the military service the office of registrar is peculiar to the Medical Department. The registrar has charge of all medical and surgical records and sees that careful and accurate clinical histories, statistical tables and charts, and all prescribed sick and wounded records are kept. He prepares all reports and returns pertaining to the sick and wounded. He, if the commanding officer does not assume direct command, commands the detachment of patients and has charge of all records, accounts, and returns pertaining thereto. He is custodian of the money and valuables of patients in the hospital. He performs such other duties as may be prescribed by proper authority. With reference to signatures on sick and wounded cards, see AR 40–1025.

295. Persons who may be admitted to Army hospitals.—All persons in active military service are entitled to admission. Under certain circumstances persons belonging to other governmental departments, such as the Navy, are also eligible. Beneficiaries of the U. S. Veterans' Administration are admitted to certain designated Army hospitals. The regulations also provide for the admission of certain civilians in governmental service, or who have had such service.

296. Disposition of patients.—*a. General.*—Unless directed by higher authority, the commanding officer of a hospital does not order a patient discharged or transferred from the hospital until, in such commanding officer's opinion, the discharge or transfer in question would not endanger the life of the patient concerned. (For disposition of the insane see AR 600–500).

b. Discharge to duty.—(1) When a patient in hospital has sufficiently recovered from his disability to enable him to perform full duty, the commanding officer of the hospital sends such patient back to his organization, or makes such other disposition of him as may be directed by higher authority.

(2) When the patient is to be returned to duty to an organization at such distance from the hospital as will require transportation for him other than such as may be furnished by the local commander, the commanding officer of the hospital makes request to the proper authority in advance for the necessary travel order, except that the travel orders for a patient in a general hospital are under certain conditions issued by the commanding officer of the hospital. (See AR 40–600.)

(3) On the day that a patient who has been formally or informally transferred to a hospital (see AR 40–1025) is discharged to duty the

commanding officer of the hospital notifies the patient's immediate commanding officer, in writing, through the surgeon of his station or command as follows:

The name of the patient.

The duration of his stay in hospital.

Whether or not the illness or injury treated was in line of duty.

Whether it was due to the patient's own misconduct.

c. Discharge to quarters.—In proper cases the commanding officer of a hospital may transfer patients from a hospital to a "quarters" status, notification in writing being forwarded as indicated above.

d. Discharge on certificate of disability.—For discharge of patients on certificate of disability see AR 615-360.

e. Discharge.—Persons other than those in the public service are, in the discretion of the commanding officer of the hospital, discharged from hospital upon completion of hospital treatment.

f. Transfer.—Patients may be transferred, under proper military authority, from one hospital or medical control to another for observation or to obtain better accommodations. (See AR 40-600.)

g. Discharge from the Army for cause other than physical disability.—Patients discharged from the Army because of expiration of enlistment, or for reason other than physical disability, are ordinarily discharged from hospital; however, if the physical condition of the patient be such that he is physically unable to leave the hospital at the time of his discharge from the service he may be permitted to remain in the hospital until such time as the commanding officer of the hospital thinks he has sufficiently recovered to be discharged therefrom.

h. Deaths.—For deaths occurring in hospitals, see paragraph 305.

i. Desertion.—Enlisted patients who desert the service while in the hospital are dropped from the rolls of the hospital and their company or detachment commanders notified of the action taken.

297. Patients' effects.—*a. General.*—These provisions have particular application to and are intended to cover the ordinary requirements of peacetime conditions. In time of war, when large numbers of patients are being received daily, strict adherence to the procedures herein prescribed may be impracticable, therefore such deviations as the commanding officer of the hospital concerned may deem necessary may be made so long as the safeguarding of the effects of patients is assured.

b. Responsibility.—The commanding officer of a hospital is responsible that due care is observed in safeguarding the money, valuables, clothing, and other effects of patients admitted to hospital.

The registrar is ordinarily the custodian of money and valuables turned over to the hospital by patients for safekeeping.

c. Money and valuables.—Patients are informed by the admitting officer that the hospital will receive for safekeeping money and valuables, including watches, trinkets, personal papers, keepsakes, etc., and that receipts will be given for such articles by a commissioned officer. In case the patient is unconscious he is searched by the admitting officer in the presence of a witness, for money and valuables, which are receipted for by a commissioned officer and properly safeguarded. Money and valuables are received and receipted for without condition or other evasion of complete responsibility by the commanding officer, or by an officer designated by him. Money and valuables of considerable intrinsic value, such as watches and jewelry, are deposited in a bank or locked in the hospital safe. Articles of less value may be stored in locked compartments in a safeguarded storeroom. Enlisted men are forbidden to receive money or other valuables from patients for safekeeping. When a patient is discharged, transferred, dies, or deserts, his money and other valuables are disposed of as prescribed for the disposition of effects other than public property. (See *f* below).

d. Method of accounting for money and valuables.—(1) The custodian (registrar) keeps a book of receipt blanks with stubs, receipts and stubs being numbered serially. He gives each patient a receipt listing the money and valuables received from him for safekeeping, and lists them on the corresponding stub which the patient signs, indicating that the list is correct and that it shows all money and valuables at the time of deposit.

(2) The custodian deposits all money in the hospital safe or in a local bank to the credit of "Patients' Fund." Money deposited in a bank draws no interest unless the patients to whom it belongs signify in writing their consent to the transfer of any accrued interest to the hospital fund. The custodian keeps a patients' fund cash account wherein is debited all money received from, and credited all money returned to, patients. This cash account is balanced at least once a month and when audited.

(3) The custodian of patients' fund has a ledger, preferably looseleafed, in which he keeps an individual account of the money and valuables of each patient. The individual accounts are balanced at least once a month and when audited.

(4) Patients desiring to withdraw money or valuables are required to present their receipt. The custodian notes on the back of the receipt and on the stub the date and amount of the withdrawal and

requires the patient to initial or sign both. In case of withdrawal of all the patient's deposits, the custodian takes up the receipt and attaches it to the proper stub. Likewise, a patient on withdrawing money or valuables is required to initial the entries thereof on his individual account in the ledger.

(5) The commanding officer of the hospital designates an officer other than the custodian to audit the patients' funds at the end of each month.

e. Public property.—If practicable, patients on being sent to hospital leave their arms and accouterments with their organizations. When brought to hospital public property is safeguarded as prescribed herein. If the patient's disability is so slight as to require treatment for a few days only the property is kept intact, tagged and stored, and returned to him upon his return to duty, his receipt being taken up; otherwise the property is, if practicable, turned over at once to his commanding officer, whose receipt should be obtained. If it is not practicable to transfer the property to the patient's commanding officer, action is taken as follows:

(1) The officer at the hospital takes up on his return Medical Department property in the soldier's possession and forwards his receipt therefor to the accountable officer.

(2) If the property officer is accountable for quartermaster or ordnance property, he takes up on his quartermaster or ordnance papers all property belonging to those departments brought in by the patient; otherwise he transfers such property to the nearest representative of those departments, whose receipts therefor are obtained.

(3) The patient's commanding officer is immediately notified of the above action.

f. Personal effects other than money and valuables.—(1) Upon admission of a patient to hospital his personal effects, other than money and valuables, are listed in duplicate on patient's property card (W. D., M. D. Form No. 75) in his presence (or in the presence of a witness in case the patient is unconscious or insane), signed by the patient (if conscious), bundled and tagged for identification (W. D., M. D. Form No. 76) and properly and securely stored. The soiled clothing of patients is washed as a part of the hospital laundry, and disinfected when it is deemed necessary, before being stored. The original property card is filed with the hospital records and the duplicate held by the patient or kept at his bedside.

(2) When a patient returns to duty, is furloughed, or is discharged from the service and leaves the hospital, the commanding officer restores his effects and takes his receipt therefor.

(3) When a patient dies or deserts, his effects are disposed of as indicated in AR 615–300.

(4) When a patient is to be transferred to another hospital his effects are, if he is able to take care of them, restored to and receipted for by him. If he is unable to take care of them, they are entrusted to the senior officer or enlisted man in whose charge the patient is being transferred. A list of the effects is furnished to such officer or enlisted man, who gives his receipt therefor to the transferring officer. On arrival at destination, the custodian of the effects while in transit turns them over, with the list, to the commanding officer (or his representative) of the receiving hospital and takes his receipt therefor.

298. Service records of enlisted patients.—*a. Upon admission or transfer of patients to a hospital.*—Whenever an enlisted man is detached from his company or other organization or station for treatment or observation by and under control of officers of the Medical Department, his company or other immediate commander sends the man's service record directly to the commanding officer of the hospital or other place to which the patient is or has been sent. If the service record is not received by such medical officer in due time, he makes a direct call upon the proper officer to furnish it. The service record of the patient is transmitted by indorsement to the several officers under whose charge he comes in the course of subsequent transfers, should such ensue, from hospital to hospital by hospital ships, hospital trains, or otherwise, or when he is sent to an organization or station for duty.

b. Upon disposition of patient.—Whenever an enlisted man, detached from his company or other organization or station for treatment or observation by and under control of the Medical Department, passes out of that control, his service record is forwarded at once by the responsible officer as follows:

(1) In case of discharge, death, retirement, capture, desertion, return to duty, or upon receiving a furlough at the expiration of which the patient is to return to his company or other organization or station, or upon being dropped, to the man's company or other immediate commander.

(2) In case of transfer to another company or other organization or station, to the immediate commander of the company or other organization or station to which the man is transferred.

(3) In case of transfer to the Government hospital for the insane, to The Adjutant General. (See AR 600–500.)

299. Miscellaneous provisions regarding patients.—*a.* Patients are not transferred from one ward to another without the authority of the commanding officer of the hospital. The transfer of a case from one ward to another is reported to the registrar with the next morning report of the ward from which the case is transferred, giving name, rank, company, regiment or corps, serial number, and ward from which and to which transferred. No special form is provided. A memorandum suffices, or a register card, W. D., M. D. Form No. 52 may be used.

b. Location index.—A suitable location index is maintained by the registrar of each hospital showing the name of each patient, the date of his admission, and the ward where he is being treated.

c. Ward morning report.—To facilitate and assure the prompt and proper distribution of patients, each ward officer every morning, immediately after his morning round of the ward, forwards to the registrar a morning report of the ward on W. D., M. D. Form No. 72, which is accompanied by diagnosis slips for new admissions, by all change of diagnosis cards, by the clinical records of all cases completed in the ward or which depart from the ward otherwise than by transfer to another ward, and by the notices of cases transferred to other wards since the preceding report. The ward morning reports, being of no permanent value, may be destroyed after they have served their purpose.

d. Hospital clothing and appliances.—Hospital clothing is worn by patients only during their stay in hospital. Each article is marked as hospital property. When very sick patients are transferred from one hospital to another the hospital clothing necessary for their comfort may be sent with them, properly invoiced and accompanied by a check list, giving the names of the men in whose possession it is. Crutches and similar articles may, if necessary, be similarly transferred with the patient from one station or hospital to another. Upon the discharge from the hospital of a patient permanently disabled, he may retain the appliances then in his use which are necessary for his comfort and safety, the accountable officer dropping the same from his stock record and submitting a certificate explaining the circumstances as a voucher for so doing, to which is appended the patient's receipt for the appliance.

300. Commutation of rations.—*a. Classes.*—The ration of any of the following classes, for a patient in a hospital, dispensary, hospital station, hospital ship, Army transport, hospital train, or convalescent camp, pertaining to the Army, is commuted at the rate indicated in *b* below:

(1) Enlisted men in the active service of the United States (including enlisted men of the Philippine Scouts).

(2) Enlisted men of the National Guard, National Guard Reserve, or Enlisted Reserve Corps admitted from training camps or service schools.

(3) Discharged soldiers undergoing treatment.

(4) Applicants for enlistment.

(5) Civilian employees of the Army who are entitled to subsistence at public expense.

(6) Prisoners.

(7) Destitute persons admitted to hospital.

b. Rates.—The ration of patients enumerated above is commuted as follows:

(1) At establishments maintained for the treatment of tuberculous patients, at the actual cost of the ration plus 90 percent; in all other cases at the actual cost of the ration plus 50 percent.

(2) The term ration as used above refers to the "garrison ration" unless otherwise directed by proper authority in time of war.

(3) In the case of members of a Reserve Officers' Training Corps unit admitted from a Citizen's Military Training Camp, while any one of these persons is a patient in a military hospital or other establishment, the ration of such patient is commuted at the same rate as the per diem ration allowance for trainees under instruction at such camps.

(4) In the case of officers and warrant officers of the National Guard and the inactive National Guard and of officers of the Officers' Reserve Corps, who may be entitled to subsistence at Government expense, while any one of them is a patient in a military hospital or other establishment, the ration of such patient is commuted at the rate prescribed as the subsistence charge for officers of the Regular Army when under treatment in the same establishment. Such disbursements are authorized under the provisions of act of March 4, 1923.

c. Vouchers.—Vouchers covering the commutation referred to above are prepared by the custodian of the hospital fund of the medical department unit concerned.

301. Subsistence and medicine charges.—*a. Subsistence charges.*—The following is the schedule of rates for subsistence charges for patients in medical department establishments (except the Army and Navy and the Fitzsimons General Hospitals) who are not entitled to commutation of rations. Rates for patients in the

Army and Navy and the Fitzsimons General Hospitals are found in AR 40-605 and 40-610.

(1) For officers, warrant officers, and nurses, $1 a day, except in hospital stations where the rate is an amount equal to the commutation rate prescribed, plus 10 cents a day.

(2) For officers and warrant officers of the Navy and Marine Corps and for civilians on the status of officers, $1.25 a day, except in hospital stations, where the rate is the same as for officers of the Army.

(3) For retired enlisted men of the Army, Navy, and Marine Corps and for civilians on the status of enlisted men, an amount equal to the commutation rate, plus 10 cents a day.

b. Medicine charges.—(1) Medicine (including dressings) charges are made for patients in medical department establishments who are not entitled to medical care and treatment at the expense of Army appropriations, including officers and enlisted men of the Navy and Marine Corps, civilian employees, and civilians.

(2) The rate for medicine (including dressings) charges for patients in medical department establishments is 50 cents per day, unless the actual cost of the medicines (including dressings) exceeds that amount, in which event the rate will be actual cost of the medicines (including dressings).

302. Laundry.—*a.* The hospital laundry consists of—

(1) The linen, clothing, and bedding belonging to the Medical Department.

(2) The washable clothing of patients under treatment in the hospital.

(3) The white coats and trousers of enlisted attendants.

(4) The uniforms of Army nurses.

(5) Washable clothing of civilian attendants when their contracts of employment entitle them to this service.

b. In localities where no quartermaster laundry is available, contracts are let to the various civil laundries for this service. (See AR 40-590.)

303. Ice.—The chief use of ice in hospitals is as an article of food or for the preservation of food. For such use it is obtained from the Quartermaster Corps, or by purchase from the hospital fund.

304. Pharmacy management.—*a. Responsibility.*—The commanding officer of the hospital is responsible for the proper operation of the pharmacy. He exercises careful supervision over it, either directly or through a subordinate medical department officer detailed by him to assume immediate charge.

b. Poisons and drugs.—(1) Potent poisons, alcohol, alcoholic liquors, and all habit-forming drugs must be kept under lock and key in a separate closet. The officer in charge of the pharmacy is responsible for safeguarding the use of the key.

(2) Within the meaning of regulations, a potent poison is any substance (drug, chemical, or reagent) which is likely to destroy human life or seriously to endanger health when applied externally to the body or when taken internally in a dose of less than 1 teaspoonful—4 cc., or, in the solid state, 4 gm.

c. Records.—(1) In time of peace and so far as practicable in time of war, all prescriptions are written in the metric system. They are placed on file in three separate files, as folllows:

(*a*) Prescriptions for alcohol or alcoholic liquors, and for medicines containing opium or any of the salts, derivatives, or preparations of opium or coca leaves.

(*b*) Prescriptions for civilians which do not include articles of the preceding class.

(*c*) All other prescriptions.

(2) Prescription files are subject to inspection by inspectors and station commanders at all times. In connection with the file for alcohol, opium, etc., a record is kept of the pharmacy receipts and expenditures of each article. Unless otherwise authorized by The Surgeon General, this record is made on W. D., M. D. Form No. 17a (Return of medical property slip, original) adapted as may be necessary for the purpose. A separate slip is kept for each form in which the liquor or drug is supplied, as "Morphinae sulphas, powder," or "Morphinae sulphas, 10-mgm. hypo. tablets." The date of receipt thereof from the storeroom is noted in the left-hand column and the amount, in the proper metric unit, in the debit column. The expenditures are noted by entering the prescription number in the left-hand column and the amount expended in compounding the prescription in the credit column. At least once a month the slips are balanced, the quantities remaining on hand verified by a medical department officer, and the facts, with date of balance, noted over his signature.

d. Charges for medicines, etc.—Civilian employees of the Army stationed at military posts may purchase medical supplies when prescribed by a medical officer. Medicine charges for employees not in hospital are as follows: In ordinary cases, 50 cents for each prescription; in the case of expensive medicines, dressings, appliances, etc., at such increased rate, to be determined by the commanding

officer of the hospital, as will reimburse the United States for their cost.

305. Deaths and preparation of remains.—Whenever the death of a person occurs at any Army hospital, the commanding officer of the hospital makes official reports in writing as indicated below. If the commanding officer of the hospital is also a post or station commander he renders, in addition to the reports required below, reports required by regulations of a post or station commander in case of a death in the command.

a. Reports.—(1) To the station commander, stating name of the deceased, his rank, and organization if a person in the military service, or definite status if a civilian employee or other civilian; the date, time, place, and cause of death; and in case of an officer, warrant officer, cadet, flying cadet, enlisted man or member of the Army Nurse Corps, whether or not death occurred in line of duty, and whether death was or was not the result of the individual's own misconduct.

(2) To the corps area, department, or expeditionary force surgeon in case of death of a medical department officer, a member of the Army Nurse Corps, or a medical department enlisted man above the grade of sergeant, giving date, time, place, and cause of death.

(3) To The Surgeon General, a duplicate of the report referred to in the preceding paragraph, in case the death has occurred within the continental limits of the United States.

(4) Such other reports as may be required by regulations or other proper authority.

b. Preparation of remains.—The commanding officer of the hospital is responsible for the preparation of the remains for burial, including verification of the employment by the undertaker of effective and scientific embalming processes where embalming is required, including vessel injection and ligation after autopsy. His responsibility does not end, if the deceased was a member of the military establishment, until the remains have been removed from the hospital or undertaker's establishment by the quartermaster for shipment or burial. The commanding officer of the hospital or his commissioned representative inspects each body immediately after death, and again after it is properly clothed and ready to be placed in the casket, and files in the hospital a signed record of the fact of compliance with the above requirements.

c. Undertaker.—Whenever the services of an undertaker or embalmer are necessary the commanding officer of the hospital promptly notifies the undertaker under Government contract, or if there be no

such undertaker, he notifies the local quartermaster, who employs an undertaker. No undertaker is to be employed who is not considered competent by the medical officer responsible for the preparation of the remains.

d. Autopsies.—(1) An autopsy can be performed upon the body of any person dying in the military service when the commanding officer of the hospital or the surgeon of a station or command deems such procedure necessary in order to determine the true cause of death, and to secure information for the completion of military records.

(2) Complete autopsy records of all autopsies performed are kept. A copy of the records of each case is forwarded directly to the Curator, Army Medical Museum. (See AR 40-10.)

306. Hospital safe.—Knowledge of the combination of the lock of the hospital safe is guarded with the utmost care by the commanding officer of the hospital. Any change in the combination is immediately reported by confidential letter directly to The Surgeon General, or, if outside the continental limits of the United States, directly to the surgeon of the department or expeditionary force concerned, identifying the safe by its make and number.

307. Hospital rules.—The commanding officer of a hospital is responsible for the formulation and enforcement of such hospital rules as are necessary for the guidance of patients and duty personnel. Rules are kept posted in appropriate places so as to be easily seen and read by those persons to whom they are applicable. The rules below have in the past been instrumental in promoting the administrative efficiency of hospitals, and serve as a good guide in drawing up detailed rules for a hospital.

a. General rules.—(1) Each officer in charge of public property will keep an accurate account of the same and of its place of distribution.

(2) Each person in charge of a department of the hospital is responsible for the public property in his department. The responsible person will keep a list of the same, and will by frequent inventories (at least once a month) assure himself of its presence.

(3) Public property in the possession of the men must be kept in good order, and missing or damaged articles accounted for.

(4) A person will upon his assignment to a department of the hospital make himself familiar with the special orders and rules governing it, and all must familiarize themselves with the standing orders of the hospital.

(5) Noncommissioned officers and privates of the detachment will be present at all formations unless specially excused.

(6) Men on duty in the kitchen and mess room will arise at least 1 hour before reveille; all other members of the detachment, unless specially excused, will arise at or before first call for reveille.

(7) Immediately after reveille each man will arrange his bed and personal belongings in a neat and orderly manner. All clean underclothing will be uniformly packed in the lockers; other clothing will be brushed and hung in the lockers or in a designated place. Soiled clothing will be kept in the barrack bags. Shoes will be polished and neatly arranged in the lockers or under the sides of the beds.

(8) Beds will be overhauled and cleaned each week and, weather permitting, the bedding and mattresses will be well shaken and hung out to air for at least 2 hours each week. Mattress covers will be changed immediately before each monthly inspection, and oftener if necessary. Sheets and pillowcases will be changed at least once each week.

(9) A card bearing the name of the soldier will be attached to the foot of his bed, and his accouterments will be hung, neatly and uniformly arranged, on the foot end iron of his bunk.

(10) The squad room will be kept clean, neat and orderly.

(11) The men will pay the utmost attention to personal cleanliness; each man will bathe at least once weekly, his hair must be kept short, face shaved, beard neatly trimmed, and underclothing frequently changed.

(12) Members of the detachment will wear the prescribed uniform at all times when present at the station. While on fatigue they may wear the fatigue clothing. While on duty in wards, pharmacy, operating room, mess room, or kitchen, they will wear the white uniform.

(13) No member of the detachment will leave the hospital bounds except by permission of proper authority or, in case of emergency, in the execution of duty.

(14) Immediately after breakfast the hospital will be thoroughly policed in every department. It must be ready for inspection at the hour designated by the commanding officer, and always kept scrupulously clean.

(15) Hospital personnel will not borrow from or have financial dealings with any patient.

(16) A noncommissioned officer in charge of quarters will be detailed daily by roster from noncommissioned officers on duty with the detachment, and an emergency squad will always be designated.

(17) The noncommissioned officer in charge of quarters will make an inspection of all wards and quarters at such times as the commanding officer of the hospital may direct, will report all unauthorized absentees to the noncommissioned officer in charge of the detachment, and will see that no unauthorized lights are burning. In case of fire he will give the alarm and proceed as ordered in fire regulations. He will be responsible for the efficient performance of duty by the guards.

(18) The guard will be under the immediate orders of the noncommissioned officer in charge of quarters. He will patrol the hospital grounds at least once every 3 hours and will be constantly on the alert for fire, unauthorized lights, and unauthorized persons in or about the hospital. The guard will at once report to the noncommissioned officer in charge of quarters all unusual occurrences and violations of existing orders which come under his observation.

b. Ward rules.—See section I, chapter 4.

SECTION III

PUBLIC PROPERTY

308. General.—*a.* Public property, commonly referred to as "Government property" covers a broad field. To supply all units of the army with every article of equipment and supply at the precise time and place needed in order to assure efficient accomplishment of objectives requires careful standardization of supply methods in addition to the application of sound business principles.

b. Waste and extravagant use of supplies must always be avoided. This can be accomplished only if all the medical department personnel are constantly on the alert to see that full value is derived from all public property in use. Timely repair will prolong the life of much equipment which will be reflected in a lowered cost of operation.

c. In checking property lists report any surplus found, since a surplus can mean but one thing—someone else is "short." This is especially true in checking ward property where frequent linen exchanges and transfer of patients tends to create discrepancies in ward property.

d. In placing new stock in warehouses or on shelves in issue rooms always arrange the stock so that the old stock on hand will be issued first. In case of large quantities, especially deteriorating items, it is well to mark the containers with the date received. Deteriorating items require frequent inspection and overhauling if undue loss from deterioration is to be prevented.

e. Lastly, do not "inflate" requisitions. Anticipate only normal expectancy of needs and do not resort to the practice of "playing safe" by asking for items and quantities of items which will probably never be required. By so doing some other unit or establishment may be deprived of its equitable share of certain supplies which at the time may be available only in limited quantities. Emergency requisitions may be submitted and are to be used to meet unforeseen requirements.

309. Accountability and responsibility.—*a.* Accountability for public property devolves upon any person who has in his possession property in storage or for issue, who has property held by others on memorandum receipt, and who is required to maintain a stock record account thereof. Such persons are called "property officers."

b. Any person in the military service having public property in his possession is responsible for that property. Revised Statutes 1303 states:

> The cost of repairs or damages done to arms, equipments, or implements, shall be deducted from the pay of any officer or soldier in whose care or use the same were when such damages occurred, if said damages were occasioned by the abuse or negligence of said officer or soldier.

c. Officers having property on memorandum receipt are called "responsible officers." Responsible officers are not required to maintain a stock record account.

d. The commanding officer is responsible for the security of all public property of his command and has pecuniary liability, together

with the property officer and responsible officers, for the strict observance of regulations in regard to its use, preservation, and issue.

e. Property officers are required to make an inventory, in person, at least once a year of all property for which they are accountable, except that held on memorandum receipt.

f. Responsible officers (those holding property on memorandum receipt) are required to inventory such property every 6 months or more often if the commanding officer requires it.

g. Sales articles in salesrooms are inventoried monthly.

h. In each case where the inventory balance does not agree with the stock record balance the necessary vouchers such as over, short, and damage reports and reports of surveys are prepared.

i. The surgeon of each station hospital is required to render a report to The Surgeon General on June 30 of the money value of Medical Department supplies issued and services paid for from Medical Department funds for use of the Regular Army during that fiscal year.

310. Supply officers.—*a*. A supply officer for each arm or service is designated for each station and maintains property accountability records.

b. An organization supply officer is appointed for each regiment, separate battalion, etc., and maintains property accountability records for all articles of equipment listed in Tables of Basic Allowances which are in the possession of his regiment, separate battalion, etc., except articles of clothing issued and charged to enlisted men.

311. Property records.—*a*. A complete record of all articles of public property for which accountability is required is maintained on stock record cards. W. D., Q. M. C. Form No. 424 or an authorized modification is used for this purpose. This record will show the quantities on hand, received, and issued.

b. Vouchers to the stock record account, namely, shipping tickets, reports of survey, and inventory and inspection reports, are numbered serially for each fiscal year. Only one series of numbers is used. Credit vouchers are designated by *C* preceding the voucher number and debit vouchers by *D* preceding the voucher number. These records are filed numerically for the fiscal year.

c. Nonexpendable property issued by an accountable officer for use within the command is carried on memorandum receipt (W. D., Q. M. C. Form No. 487) bearing signature of the responsible officer. Accountability for such property remains with the property officer. This record may be termed an "individual account."

d. In order that the quantity and location of all property on memorandum receipt may be known at any time each property officer maintains a general record or account of the quantities and location of articles issued to individuals and organizations. W. D., Q. M. C. Form No. 488 is used for this purpose. This record may be termed a "general account."

e. Medical supply officers are required to submit to the Surgeon General on December 31 a report showing the quantity of all medical department supplies on hand as of that date.

f. All property accounts are audited once each fiscal year by a property auditor who issues certificates of audit showing status of the account concerned. One copy is forwarded to the corps area commander, one copy to the chief of finance, and one copy to the accountable officer.

312. Accounting for property in time of war.—*a*. In time of war, accounting for property of all kinds on hand and issued in the theater of operations will conform to the procedure outlined in FM 100-10. When an organization passes out of the theater of operations, the commanding officer will cause to be made by a disinterested officer a complete inventory of all property on hand and will cause a new account, based upon this inventory certified to by the disinterested officer, to be set up.

b. Likewise, should any other property pass out of the theater of operations (except for purposes of salvage) which is not accounted for on some accountability record and its movement covered by shipping tickets in the usual manner, the proper commanding officer will cause it to be inventoried by a disinterested officer and the property taken up on an appropriate property account in accordance with the certified inventory.

313. Classification of property and equipment.—*a*. Expendable property consists of those items which are consumed in the maintenance and upkeep of the military establishment. Expendable items of the Medical Department are designated by an *x* in the appropriate column of the Medical Department Supply Catalog. Drugs, surgical dressings, stationery, and soap are examples of this type of property. All issues of expendable property are consolidated at the end of each month and are listed on a shipping ticket, W. D., Q. M. C. Form No. 434. This shipping ticket after being approved by the commanding officer becomes a credit voucher and is posted to the accountable officer's stock record account.

b. Each supply branch determines which items issued by it shall be classed as expendable.

c. Nonexpendable property comprises all other articles of public property. Such articles can be dropped from the property account only on transfer to another station (signed shipping ticket), approved reports of survey, and approved inspection and inventory reports.

d. China and glassware of quartermaster corps issue lost or damaged through carelessness is charged to those responsible for the loss or damage. An allowance for unavoidable breakage is established by the corps area commander for each post, camp, or station. This allowance is based on strength of the command.

314. Classification of equipment and supplies.—*a.* Tables of Basic Allowances prescribe the list of articles constituting the equipment of units and individuals. A separate table is published for each arm or service. These tables are arranged in sections according to supply arms and services and the items of equipment in each section are listed alphabetically. Each section is generally subdivided further to provide for such groups as "individual equipment, clothing," "individual equipment, other than clothing," and "organizational equipment."

b. The body of the table is made up of five columns. In the first column, headed "Items", appear the items of equipment, alphabetically listed. The second column is headed "For mobilization" and contains the basic allowances for mobilization. In the third column, headed "For peace", appear the basic allowances for units at posts, camps, and stations in time of peace which are taken with the unit on change of station. The fourth column is blank and is used in computing totals for any particular unit. In the fifth column, headed "Basis of issue and remarks", appear the remarks necessary to establish definitely, in conjunction with the numbers appearing in the second or third column, the basis of issue for each item.

c. Allowance of component and spare parts, accessories, and expendable articles are prescribed in the supply catalogs or circulars of the various supply arms and services, or by a budget system of money value credit.

d. Tables of Allowances prescribe allowances of equipment authorized for posts, camps, and stations. Such equipment is authorized for posts, camps, and stations partly on the basis of the units stationed thereat and is in addition to that authorized in Tables of Basic Allowances. This equipment is not ordinarily taken with a unit into the field or on change of station.

315. Classification of medical supplies.—*a.* The Medical Department Supply Catalog lists those items the issue of which is the responsibility of the Medical Department.

b. Items listed in the Medical Department Supply Catalog constitute "standard medical supplies", and those not listed in the Supply Catalog but procured by the Medical Department as required are designated as "nonstandard." The standard medical supplies are divided into classes and subclasses as follows:

(1) Class 1. Drugs, chemicals.
Biological stains.
Biological products.

(2) Class 2. Surgical dressings.

(3) Class 3. Surgical instruments. Surgical appliances, miscellaneous diagnostic instruments, and surgical supplies.

(4) Class 4. Laboratory equipment and supplies.

(5) Class 5. Dental equipment and supplies.

(6) Class 6. X-ray equipment and supplies.

(7) Class 7. Furniture.
Physiotherapy equipment.
Hospital linen and bedding.
Mess equipment and supplies.
Cleaning and preserving equipment and supplies.
Stationery and miscellaneous office equipment and supplies.
Miscellaneous hospital equipment and supplies.

(8) Class 8. Veterinary equipment and supplies.

(9) Class 9. Field equipment and supplies.

316. Branch responsibility.—*a.* The Medical Department is responsible for the procurement, storage, and issue of medical, dental, and veterinary supplies and equipment.

b. The surgeon of each station or command designates one Medical Department officer, who becomes the accountable officer for the Medical Department supplies at that station and command. The surgeon also designates one Medical Department officer, usually the accountable officer (medical supply officer), as the Medical Department purchasing and contracting officer.

c. The classification, nomenclature, and item numbers listed in the Medical Department Supply Catalog are used in the preparation of all papers pertaining to standard medical items.

317. General requisitions.—*a.* Requisitions for supplies and equipment pertaining to any of the supply arms or services are or-

dinarily prepared on W. D., Q. M. C. Forms Nos. 400 and 401 (extra sheet).

b. Replenishment of organizational equipment, except that chargeable to enlisted men's clothing money allowance, is normally obtained through the organizational supply officer, who obtains such items from the station supply officer charged with the procurement, storage, and issue of the particular item.

c. Separate requisitions are prepared for supplies stored and issued by the different supply branches.

318. Requisition for medical supplies.—*a. General.*—(1) Requisitions are prepared by the medical supply officer at the station after he has obtained from the chief of each service of the Medical Department at his station a list of supplies required for the period covered by the requisition.

(2) These lists are consolidated and the data thus obtained is used in conjunction with the quantity of stock on hand and the quantity consumed during the previous period in determining the amounts to be requisitioned. This amount, however, shall not exceed the allowance established for the post or station.

(3) From time to time, as supplies are issued to the various services, the medical supply officer will advise the officer concerned as to the quantity of stock on hand, in order that he may avoid expenditures in excess of authorized allowances.

(4) When necessary, department and corps area surgeons and the commanding officers of general hospitals are authorized to forward emergency requisitions for *biological products only* direct to their issue depots. One copy of the requisition, showing action taken, is forwarded to The Surgeon General.

(5) All requisitions are numbered serially, a new series being started at the beginning of each fiscal year.

(6) Separate requisitions are submitted for nonstandard items. These items are listed alphabetically and by class, and each must be followed by a brief description of the item or the manufacturer's catalog number, name, and address.

(7) In case of spare parts for an item, whether standard or nonstandard, care must be taken to describe properly the part required. Name, manufacture, model, and serial number of the item for which the part is required must be shown under the item on the requisition.

(8) When electrical equipment or parts for such equipment are required, type of current and voltage (with cycle and phase if alternating current) must be cited.

(9) Likewise, if the equipment is for steam operation, steam pressure available must be shown, and if the item is heated by gas, the requisition must state whether the gas available is artificial or natural.

(10) Each requisition is signed by the medical supply officer and approved by the surgeon, or, in the case of a general hospital, by the commanding officer.

b. Designation.—Requisitions are designated as "Semi-annual," "Quarterly Standard," "Quarterly Nonstandard," and "Emergency."

(1) *Semi-annual requisitions.*—(*a*) Semi-annual requisitions are submitted in triplicate March 31 and September 30 for all standard nondeteriorating items except those items which require authority of The Surgeon General (identified by "SG" in column of allowances). Blank forms are requisitioned also at this time. Requirements are fixed by determining the differences between stock on hand and consumption for the past 12 months.

(*b*) For nonexpendable items such amounts will not exceed the authorized allowance for the particular station as shown in the Medical Department Supply Catalog, and for expendable items will not exceed the depot credit of the particular station.

(*c*) Requisitions for items bearing the notation "SG" in the allowance column of the Medical Department Supply Catalog will be submitted in quintuplicate so as to reach The Surgeon General 30 days prior to the semi-annual requisition period. These requisitions will be accompanied by a letter stating clearly and fully the need for such items. Corps area surgeons will scrutinize these requisitions and without explanation to The Surgeon General cancel all items not deemed essential. General hospitals will submit such requisitions in quadruplicate direct to The Surgeon General.

(2) *Quarterly requisitions.*—Quarterly requisitions are submitted in triplicate on the last day of each quarter, March 31, June 30, September 30, and December 31. One requisition is submitted for standard items and one requisition for nonstandard items.

(*a*) Deteriorating items only are listed on the standard quarterly requisition. These items are identified by the figure 1 in the column immediately following the item number as listed in the Medical Department Supply Catalog. Requirements are fixed by determining the difference between stock on hand and consumption during the previous 6 months. The standard biological products, with the exception of smallpox vaccine, remain potent and suitable until expiration of the time limit stated on the container, provided these products are kept refrigerated. Smallpox vaccine deteriorates within a comparatively short time when stored at the usual refrigerator

temperature. For this reason, smallpox vaccine is shipped monthly by the issuing depot. Accordingly, the requisition for smallpox vaccine shows the quantity required for each month of the period for which requisitioned. These quantities are forwarded automatically each month from the issue depot.

(*b*) The quarterly nonstandard requisition is submitted in quintuplicate and includes the nonstandard items required for the quarter. In addition to the data required, requisitions for nonstandard items are forwarded with a letter of transmittal stating in detail the necessity for each item, and in case of an item similar in nature or type to one listed in the Medical Department Supply Catalog full information why the standard item is not suitable. In the preparation of nonstandard requisitions care must be exercised to keep the cost of the requisition within the limits of the credits for nonstandard items established for the station.

(3) *Emergency requisitions.*—Emergency requisitions are submitted only when the necessity for supplies is urgent, and must be accompanied by a letter of transmittal, signed by the surgeon, giving full details of the emergency. Care in determination of requirements for all types of requisitions will prevent the necessity for submission of many emergency requisitions. All stations under the jurisdiction of corps area surgeons will submit such requisitions in quadruplicate. All others will submit their requisitions in triplicate.

c. Requisitions to Army Medical School.—Quarterly requisitions will be forwarded to the Army Medical School, Army Medical Center, Washington, D. C., for items issued from that point, as indicated in the Medical Department Supply Catalog, without reference to The Surgeon General. If these supplies are required in an emergency they will be obtained on emergency requisition forwarded in the same manner.

d. Requisitions on corps area laboratories.—Quarterly requisitions will be forwarded to the commanding officer, corps area laboratory, for items issued from these points, as indicated in the Medical Department Supply Catalog, and without refernce to The Surgeon General. If these supplies are required in an emergency they will be obtained on emergency requisition forwarded in the same manner.

e. Antirabic vaccine.—Requisitions for antirabic vaccine will be made by telegraph direct to the corps area surgeon, or in case of a station beyond the continental limits of the United States to the surgeon of that force, stating in each instance the number of individuals to be treated. The vaccine shall be kept in a refrigerator, and a fresh vaccine will be employed for each case treated.

f. Medical journals.—Medical, surgical, dental, veterinary, and nursing journals are furnished each station without requisition. Nonreceipt of any particular number of these journals is to be reported direct to the publisher or agent, and subsequent nonreceipt will be reported to The Surgeon General.

g. Medical books.—A money allowance is established annually for medical books at the discretion of The Surgeon General in favor of corps area surgeons for the medical units under their jurisdiction, and the commanding officers of general hospitals in the United States. Requisitions are submitted in accordance with instructions issued by The Surgeon General. The estimated value of the books requisitioned will not exceed the authorized money allowance.

h. Flashlights, batteries, and lamps.—When medical units require batteries and lamps for medical department apparatus in which the signal corps standard can be used, quarterly requisitions will be submitted direct to the signal corps representative charged with furnishing signal corps supplies to the station concerned, quoting thereon the appropriate procurement authority numbers, as published in circular letters issued by The Surgeon General. If the items are required for equipping field units for which there is a Table of Allowance, the requisition will so state and procurement authority numbers will not be used, as reimbursement to the Signal Corps is not required. Batteries and lamps required for medical department apparatus on which the signal corps standard cannot be used will be obtained from medical supply depots on requisition.

i. Depot credits.—The Surgeon General furnishes each post, camp, and station within the continental limits of the United States a statement of the depot credit for standard expendable supplies authorized for the ensuing fiscal year. Depot credits are established also for nonstandard supplies for the larger stations. Blank forms and items issued by the Army Medical School and corps area laboratories are not charged against depot credits.

j. Action on requisitions.—(1) Semiannual and quarterly standard requisitions of posts, camps, and stations under corps area or department control are forwarded to the corps area or department surgeon who, after acting upon the requisition, returns one copy to the requisitioning officer (showing thereon the depot of issue and the amounts approved), retains one copy in his own files, and forwards one copy to the depot designated to make the issue. Similar action is taken on nonstandard requisitions of stations having nonstandard depot credit except that three copies of the requisition are forwarded to the depot of issue. As soon as information is available or purchase

has been made the depot will note on copy the actual cost of each item and return it to the corps area or department surgeon. Requisitions for "SG" items, and quarterly nonstandard requisitions from stations for which depot credit has not been authorized are forwarded by the corps area surgeon to The Surgeon General by indorsement.

(2) Medical supply officers at issue depots (including Army Medical School and corps area laboratories) fill emergency requisitions and the quarterly standard requisitions as promptly as possible. Semiannual and nonstandard requisitions are filled as rapidly as emergency work will permit, but must reach the requisitioning office not later than 3 months from date of requisition.

k. Spectacles.—Medical officers prescribe spectacles required for the correction of visual defects of the military personnel, but except when such defects are due to violence suffered in the performance of duty the Government will not supply spectacles for their correction. When spectacles are required for the correction of visual defects due to violence suffered by an officer or an enlisted man in the performance of duty, application for authority to purchase them at public expense will be made to The Surgeon General, or if serving beyond the continental limits of the United States to the surgeon of the forces there on duty, with a history and an estimate of the cost of the required spectacles.

319. Transfer of property.—*a.* Public property is normally transferred through the medium of shipping tickets (W. D., Q. M. C. Form No. 434) prepared by the shipping officer and forwarded in duplicate to the receiving officer, who checks the quantity listed on the shipping ticket, signs both copies, enters the items on his stock record account, returns one copy to the shipping officer, and files one copy as a voucher to his stock record account.

b. Separate shipping tickets are used for property of each separate supply arm or service. The items are listed thereon according to the approved classification of the particular supply arm or service.

320. Shipment of property.—*a.* An officer making a shipment lists the property to be shipped on 5 copies of W. D., Q. M. C. Form No. 434, which are disposed of as follows:

(1) Two copies to the receiving officer, one for his files and one to be signed by him after receipt of the property and returned to the shipping officer.

(2) Two copies to the finance officer of the corps area in which the receiving officer is located, who compares them, stamps both copies to show name of his office and the date, files one copy, and sends the

other copy to the finance officer of the corps area of the shipping officer for use in auditing credit vouchers.

(3) One copy to be retained by shipping officer.

b. When initial issue is made of equipment authorized in Tables of Basic Allowances, three copies of the shipping ticket are prepared. Two copies are given to the supply officer who receives the property and one copy is forwarded to the corps area finance officer. The copy receipted by the receiving officer will be returned to the shipping officer and filed as a voucher to his stock record account.

c. Property purchased locally is entered on receiving report (W. D., Q. M. C. Form No. 431) prepared in triplicate, only the original of which is certified by the officer on duty as accredited inspector who inspects and accepts the property for the Government. The three copies are disposed of as follows: The certified original and one copy are forwarded to the disbursing officer designated to make payment, and one copy is retained and filed as a voucher to the stock record account.

321. Issue of clothing.—*a.* Clothing when required is normally issued in bulk to the company or detachment commander once each quarter. Separate requisitions are prepared for that chargeable against the clothing allowance of enlisted men and that which is carried on the accountability of the regimental, separate battalion, etc., supply officer.

b. When clothing to be charged against the clothing money allowance is desired in bulk, the company or detachment commander will cause the enlisted men to submit requests on W. D., A. G. O. Form No. 35 for the articles required by them. These requirements are consolidated and listed in duplicate on W. D., Q. M. C. Form No. 409. After signature by the company or detachment commander, and approval by the commanding officer, both copies of the requisition are forwarded to the quartermaster, who gives notice to the company or detachment commander when the clothing is ready for issue.

c. The company commander and the quartermaster or his representative certify on both copies the fact of receipt and issue, after which the articles may be removed from the quartermaster's storeroom. The company or detachment commander or his representative should at once issue the clothing to the enlisted men, enter on the request submitted by each enlisted man the quantities issued to him, obtain the enlisted man's receipt, and sign the slip as having issued the articles.

d. Clothing not issued should be returned to the quartermaster within 24 hours after the clothing was drawn. Both copies of W. D., Q. M. C. Form No. 409 are completed by the quartermaster and the company or detachment commander, the duplicate copy being retained by the latter. The duplicate copy is then completed as to unit prices and totals; the articles issued to the men are entered on the respective individual clothing records (W. D., A. G. O. Form No. 32) and the money value charged to the men on W. D., Q. M. C. Form No. 22. The duplicate copy of the requisition and the individual clothing slips are filed in the company records with W. D., Q. M. C. Form No. 22.

e. When the issue of clothing to an individual enlisted man is necessary, individual clothing slips are prepared in duplicate, on which the quartermaster makes direct issue, the original being retained by the quartermaster and the duplicate given to the company or detachment commander. These articles are immediately entered on W. D., A. G. O. Form No. 32, and the money value on W. D., Q. M. C. Form No. 22.

f. Fuel, forage, gasoline, and oil are issued as required. Requisitions for this class of property are not made out in advance.

322. Transfer of property accountability.—*a. General.*—(1) A transfer of public property involves a change of possession and accountability. In ordinary cases of transfer, the transaction is effected through the medium of shipping tickets, one copy of which is receipted by the receiving officer and returned to the transferring officer. When a complete transfer of property accountability is made, both the transferring officer and his successor satisfy themselves by count and examination under their personal supervision that all balances on the stock record cards are actually on hand and in the condition shown on the cards.

(2) The officer being relieved of accountability prepares, in triplicate, a list of balances as shown by the stock record accounts.

(3) The officer being relieved of accountability and the officer assuming accountability both sign a certificate placed on each list of balances as to the truth and correctness of the list of balances on which the property accountability is transferred. This certificate must be approved by the commanding officer.

b. Transfer of property on memorandum receipt in possession of troops changing station.—A settlement is made with the supply officers for such supplies as are not to be taken with the troops prior to departure from the station. For such supplies as must accompany troops other than articles of equipment contained in Tables of Basic

Allowances, company or detachment commanders give memorandum receipts to the accountable officer who will transfer accountability to the accountable officer at the new station, attaching to the shipping tickets a signed copy of the memorandum receipt.

c. Transfer of property in possession of enlisted men changing station.—(1) When an enlisted man is transferred or detached from his organization, the company or detachment commander credits the enlisted man's individual equipment record (W. D., A. G. O. Form No. 33) for all articles charged thereon that are turned in by the enlisted man previous to departure, and completes the individual equipment record to show a complete list of the articles, including clothing not charged on the clothing account, which the soldier takes with him. A true copy of W. D., A G. O. Form No. 32 is prepared and authenticated by an officer and is retained with the records of the organization from which the enlisted man was transferred until the next audit and inspection. All articles other than clothing charged against the clothing allowance and expendable property taken by the enlisted man as shown on the individual equipment record are entered on W. D., A. G. O. Form No. 35 in quadruplicate. Should property so taken include garrison equipment held on memorandum receipt a separate W. D., A. G. O. Form No. 35 is prepared. All copies of these forms are receipted by the enlisted man and signed by the organization commander.

(2) The original W. D., A. G. O. Form No. 35 is presented by the organization commander to the regimental or other interested accountable officer and he obtains a memorandum credit slip for the items listed thereon.

(3) The commanding officer forwards the original clothing record, the individual equipment record, and the duplicate, triplicate, and quadruplicate copies of the individual clothing slip or slips with the enlisted man's service record to the commanding officer at the enlisted man's new station.

323. Lost, damaged, and unserviceable property.—*a. General.*—(1) Officers and other persons responsible for public property are charged for any loss or destruction of, or damage to, property for which they are responsible unless they are relieved from responsibility therefor through an approved report of survey or in other manner in accordance with regulations. Stoppages against enlisted men directed after due procedure are entered on the pay roll, and the enlisted man when signing the pay roll is informed that his signature will acknowledge the justice of the charge. He

is also to be advised of his right to demand a survey and the approved recommendation of the surveying officer will be final.

(2) Civilian employees may be held for the loss of property due to neglect or embezzlement.

b. Shortage or damage in shipment.—(1) A notation is made on the bill of lading given the carrier, and an over, short, and damaged report (W. D., Q. M. C. Form No. 445) is executed in triplicate by the receiving officer, except when the value of property does not exceed $10.00 and when the common carrier accepts responsibility.

(2) If the value of property damaged or short does not exceed $10.00, W. D., A. G. O. Form No. 15 is accomplished in triplicate. This report is submitted to the commanding officer who, if satisfied the best interests are so served, may approve the report as submitted. The report thus approved is an acceptable voucher for terminating accountability for such shortage or damages. Copies are disposed of as for reports of survey (par. 324 *c*).

(3) If the common carrier accepts responsibility as evidenced by a written acknowledgment signed by the carrier's local agent, W. D., A. G. O. Form No. 15 is accomplished in triplicate, and the acknowledgment of responsibility is attached thereto. The commanding officer may, in his discretion, approve the report without reference to a surveying officer. Approved report of survey is used as a voucher to terminate accountability for the loss or damaged property. Copies are disposed of as for reports of survey (par. 324 *c*).

(4) If over, short, and damaged reports are prepared, one copy is filed temporarily with the corresponding shipping ticket and two copies are forwarded to the shipping officer.

(5) If the shipping officer accepts responsibility for the shortage, he approves the over, short, and damaged report by signing both copies, adjusts his stock record account accordingly, and attaches one copy of the approved report of the corresponding shipping ticket in his file. The other copy is forwarded to the receiving officer for file with his copy of the corresponding shipping ticket.

(6) If the shipping officer refuses to accept responsibility for the shortage, he places "Disapproved" over his signature on both copies of the over, short, and damaged report, retains one copy for his file, and returns the other copy to the receiving officer, attaching thereto such affidavits and certificates as he desires to present as evidence of his freedom from fault and neglect.

(7) Upon receipt of a disapproved over, short, and damaged report, the receiving officers initiate W. D., A. G. O. Form No. 15 in triplicate.

324. Unserviceable and obsolete property.—*a. Classification.*—Such property is classified with reference to disposition as—

(1) *Class 1.*—Property worn out or otherwise rendered unserviceable by fair wear and tear in the military service, and property declared obsolete by competent authority. Property of this class is listed on W. D., I. G. D. Form No. 1, in duplicate, and is submitted to the action of an inspector without prior action by a surveying officer.

(2) *Class 2.*—Property rendered unserviceable from causes other than fair wear and tear in the service or obsolescent. Property of this class is listed on report of survey and action taken in accordance with regulations covering this method of disposition.

b. Supervised items.—Supervised items of Medical Department equipment are indicated by the "$" sign in the note column of the Medical Department Supply Catalog. This classification comprises such articles as are difficult to procure for any reason and those over which special control should be exercised. The responsible officer submits a list of such articles through channels to the corps area, depot, or arsenal commander, requesting permission to place the articles on an inventory and inspection report for the action of an inspector.

c. Reports of survey.—(1) *General.*—Reports of survey are prepared in triplicate on W. D., A. G. O. Form No. 15. Separate reports of survey are made for property pertaining to the different supply branches. Copies of all pertinent papers, such as over, short, and damaged reports, bills of lading, affidavits, and certificates are attached to the report of survey as exhibits. Surveys are instituted by the responsible officer as soon as practicable, and in every case within 30 days after discovering the loss, destruction, or damage, unless exceptional circumstances, which will be explained by the officer's certificate, prevent such action within the prescribed period.

(2) *Appointment of survey officers.*—Survey officers are ordinarily appointed by the commanding officer from field officers of his command whenever practicable, but may be appointed by higher authority. Officers who are accountable or responsible or in any manner personally interested in property to be surveyed are not appointed as surveying officers.

(3) *Duties of surveying officers.*—The surveying officer investigates fully all matters submitted to him, calls for and scrutinizes all obtainable evidence, ascertains and reports all facts pertaining to the case, and submits an opinion and makes recommendation as to the

question of responsibility and the disposition of the property found to be unserviceable.

(4) *Disposition and use of report of survey.*—Reports of survey, when approved by appointing or higher authority, as may be required, are valid for file as property vouchers. One copy is forwarded to the accountable officer and two copies to the corps area commander.

d. Inspection and inventory reports.—Separate inventory and inspection reports are prepared for articles listed as supervised and as not supervised and for property pertaining to the different supply arms and services. The responsible officer prepares and signs two copies of W. D., I. G. D. Form No. 1, listing the property to be inspected. Property for presentation to inspectors is arranged in order of enumeration on the report. The responsible officer accompanies the inspector and must be prepared to give all necessary information in regard to the property. The inspector may recommend that the property inspected be—

Continued in service.
Turned in to depot or arsenal.
Turned in for reclamation of component parts.
Destroyed.
Sold.
Turned in to salvage.
Used as target materials.

The action of the inspector in the case of unsupervised items is final unless he recommends that the property "be turned in to a depot or arsenal", in which case the report will be forwarded to the corps area commander for final action. The destruction of property must be witnessed by a disinterested officer.

e. Salvage of property.—Unserviceable property, both expendable and nonexpendable, having a salable value is turned in to salvage. Nonexpendable property is turned in to salvage when such action is recommended by inspectors and surveying officers and after report has been approved by higher authority if such authority is required. The salvage officer signs the inspection and inventory report as having received into salvage those items so indicated.

SECTION IV

HOSPITAL FUND, MESS MANAGEMENT, AND FOODS

325. General.—The management and general administration of a hospital mess is one of the most important duties devolving upon enlisted men of the Medical Department, as upon the success of the mess depends not only the welfare of the patients but much of the contentment and happiness of the men themselves. In the smaller hospitals economy requires that only one mess be maintained for both patients and duty personnel. On the other hand, in the larger hospitals it is frequently necessary to establish four or five different messes in order to care properly for the classes of patients and duty personnel being subsisted.

326. Hospital fund.—*a*. See AR 210-50. The hospital fund is maintained in every hospital for the purpose of messing the hospital personnel and patients and providing authorized and legitimate recreation and entertainment.

b. The sources from which the hospital fund are derived are: Ration allowances of patients and enlisted men on duty; dividends from the post exchange; sales from the garden; money received for the subsistence of officers and civilians treated in hospital; the sale of property purchased with the hospital fund or products pertaining to the hospital fund; nurses subsisted in a mess conducted by the commanding officer.

c. The hospital fund is kept by the commanding officer or by an officer detailed by him for this duty, who is held responsible for the loss of any portion of the fund not deposited in a bank or the hospital safe. Expenditures therefrom are limited to the purchase of food or other articles for the benefit of patients and enlisted men on duty in the hospital. Savings on food supplies (rations) may be spent only for the purchase of food for the messes.

d. A statement of the hospital fund is prepared monthly and audited by the hospital council, the proceedings of which are recorded on the retained statement of the hospital fund. Articles such as musical instruments and athletic appliances, purchased with the hospital fund, are known as "durable property", and remain the property of the hospital fund, being accounted for on the return. All hospital fund statements are finally approved and filed in the Surgeon General's Office.

327. Mess management.—*a*. The provisions of regulations relating to company messes are applied, as far as they are adaptable, to hospital messes.

b. The food supplies for the patients and enlisted hospital personnel consist of rations issued by the Quartermaster Corps, of articles purchased with or derived from the hospital fund, and of products of the hospital garden.

c. When, under the conditions usually prevailing at any station or with any command, the commutation of the rations of the patients in hospital is not sufficient for the purchase of suitable food, the commanding officer of the hospital makes application through military channels to The Adjutant General for the issue of rations in kind.

d. For methods of preparing food for patients and personnel, reference should be had to technical manuals on the subject.

e. When the number of patients requiring special diet is large, the commanding officer of the hospital establishes one or more diet kitchens for the preparation of their food, under the immediate direction of such skilled dietitians as are available. Competent dietitians may be assigned to this duty. The commanding officer of the hospital prescribes rules for the managment of diet kitchens.

328. Mess sergeant.—The noncommissioned officer selected for this assignment must be not only a man of intelligence and business capacity, but also one who has had actual experience in the kitchen and is well grounded in the principles of cooking. He is in immediate charge of the mess and directly responsible to his commander for its efficient management. He draws or purchases all rations and other supplies required for the mess, prepares all bills of fare if a dietitian is not provided, and keeps a daily statement showing the exact financial condition of the mess. He is directly responsible that only sound products are accepted and for the care and preservation of the supplies on hand. He is also responsible for keeping a careful check on all property utilized in the mess, the neat and clean appearance of personnel on duty in the mess, the promptness with which they

report at their places of duty, the orderly conduct of all those present at meals, and the proper preparation and serving of meals.

329. Cook.—*a.* Cooks work under the direct orders and supervision of the mess sergeant. During the service of the meal cooks on duty remain in the kitchen and serve the food to the waiters. Personal cleanliness on the part of a cook is of the greatest importance. He should bathe and have a change of clean clothing daily. White uniforms, skull caps, and aprons are provided for him. He must always be orderly in and about his kitchen, keeping it and his utensils scrupulously clean. It is important to have a place for each utensil and to keep it there, clean and ready for use when required.

b. The cook assists the mess sergeant in drawing up the bill of fare. Their success depends largely upon their ability to estimate correctly, or better still, figure correctly the kinds, quantities and cost of the supplies which will be required in the preparation of any meal. The "income" of the mess must be constantly borne in mind; otherwise there is apt to be a "deficit" of funds. After the bill of fare for the day is made, the cook will save himself much time and labor by carefully reading it over and formulating a plan of the details necessary to put it into effect.

330. Food and its constituents.—Food may be regarded as anything which, taken into the body, is capable of supplying material for growth and repair of tissues, and of furnishing energy for bodily heat and work. The essential nutrients may be grouped in the headings of sources of energy, especially carbohydrates and fats; proteins; minerals, including salt; vitamins; and water.

a. Energy.—(1) The body must have enough food for activity and warmth. It obtains energy from carbohydrates, fats, and proteins. The major and most economical sources are carbohydrates, present chiefly in starches and sugars, in bread, cereals, and starchy vegetables; in fats in animal foods such as meat, eggs, milk, butter, and lard; and in vegetable fats such as cottonseed, corn or olive oil, and the hardened vegetable fats.

(2) Energy is usually expressed as standard units of heat—calories. The energy values of the chief energy-yielding constituents of food are, in round numbers, carbohydrates and proteins, 4 calories per gram, and fats, 9 calories per gram. A certain quantity of energy is required in the process of existence. Any movement or exposure to cold requires additional energy. The average man at light work requires approximately 3,000 calories, while one at hard work requires about 4,000 calories a day.

b. Protein.—(1) Protein must be included in the diet in order to build and repair muscle and other tissues and to replace proteins broken down in the ordinary processes of existence. The value of protein varies with its amino acid content. Animal proteins generally contain a better distribution of amino acids than the vegetable proteins. Some animal protein is necessary to supply all the needed amino acids.

(2) The usual sources of protein are milk, eggs, cheese, lean meat, fish, and poultry. Good sources of vegetable protein are cereal grains, nuts, beans, peas, and other legumes. These in general supply protein less valuable for growth, but useful for supplementing the proteins from animal sources.

c. Minerals.—(1) The proper development of bones, teeth, muscles, nerves and blood requires certain mineral salts. The average diet is most apt to be deficient in calcium, phosphorus, or iron (and in some regions iodine). *Salt* is necessary at all times. Where excessive perspiration occurs additional salt is needed.

(2) Milk (fresh or dried) and cheese are the best sources of *calcium* Lean meats, especially the liver, kidney and heart, egg yolk, and whole grain cereals, are good sources of *phosphorus* and *iron*, and dried fruits and potatoes are good sources of *iron.* Fruits and vegetables in general are a source of some minerals.

d. Vitamins.—Vitamins are essential for growth and health and each performs special functions in the body. In their absence nutritional diseases may occur.

(1) *Vitamin A.*—(*a*) Vitamin A keeps the skin cells inside and outside of the body healthy and protects against bacterial infection. Early deficiency causes night blindness.

(*b*) Vitamin A is found in fats of various kinds, in the yellow and green vegetables, and in fruits. Good sources are cream, butter, cheese, egg yolk, liver, tomatoes, green leafy vegetables, yellow vegetables, and fruits.

(2) *Vitamin B_1.*—(*a*) A deficiency causes changes in the nervous system resulting in beriberi, loss of appetite, and interference with digestion.

(*b*) Good sources are whole grain cereals, dried beans, peas, peanuts, pork, and liver. If the supply of these foods is limited, dried yeast should be taken. In complete absence of these foods three tablespoonsful of dried brewer's yeast daily will meet the vitamin B needs. Vitamin B_1 is soluble in water and if foods are cooked in a considerable quantity of water which is thrown away, part of the vitamin B_1 is lost.

(3) *Vitamin B_2 or G.*—(*a*) A deficiency of vitamin B_2 causes cracks in the corners of the mouth, certain skin diseases, and partial blindness through the production of changes on the cornea of the eye.

(*b*) The best sources are liver, milk, egg yolk, dried yeast, and green leafy vegetables.

(4) *Nicotinic acid* (*pellagra-preventive factor*).—(*a*) A deficiency in nicotinic acid results in pellagra. Early symptoms may be a red tongue or ulcerations in the mouth which are easily mistaken for trench mouth. This may or may not be accompanied by digestive upsets and mental depression.

(*b*) Good sources of nicotinic acid are lean meats of all kinds, liver, fish, wheat germ, leafy green vegetables, and dried yeast. It is to be noted that dried yeast is the richest natural source of the B vitamins (B_1, B_2, and nicotinic acid).

(5) *Vitamin C* (*ascorbic acid*).—(*a*) A deficiency in ascorbic acid causes scurvy, which may manifest itself early by swollen gums which bleed easily, defective teeth, weakened capillaries, poor bone knitting, tender joints, and lessened resistance to infection.

(*b*) Excellent sources are fresh or canned citrus fruits, tomatoes or tomato juice, and cabbage. Other sources are fresh or canned fruits and berries of all kinds, leafy vegetables, and sauerkraut.

(6) *Vitamin D.*—(*a*) Vitamin D affects the efficient utilization of the bone-building elements. This is especially true when the supply or proportion of calcium and phosphorus is inadequate.

(*b*) Good sources of vitamin D are sunshine, fish liver oils, and, to a lesser extent, cream, butter, eggs, liver, and some fish.

(7) *Vitamin K.*—Vitamin K is concerned with the formation and elaboration of prothrombin, one of the factors in the coagulation of blood. Excellent sources of vitamin K are the green leafy vegetables. Tomatoes and hog liver are good sources.

(8) *Other vitamins.*—If natural food sources of the above vitamins are used, it is not necessary to be concerned about others. All of the above vitamins can be obtained either in synthetic form or as potent concentrates.

e. Water.—The presence of water is necessary to help the main functions of the body, the normal activity of the intestines, the eliminations of waste products, and the control of the body temperature. It is necessary that more water be taken in the summer and in occupations involving exposure to heat. In this connection it is essential that ordinary table salt or sodium chloride be taken in increased quantities. Heat exhaustion is due to a depletion of salt from exhaustive perspiration. All water should be sterile or

properly chlorinated. Water may be easily sterilized by boiling for 5 minutes. Special instructions are furnished for chlorination.

f. Bulk.—Sufficient bulk must be taken to stimulate intestinal movement.

331. Planning an adequate diet.—*a.* The following comments apply to the selection of an adequate diet from foods available in the ration:

(1) The diet outlined below is in accordance with present American standards. Much reduction in any of the categories listed here may result in less than optimum growth and development and the development of mild and unrecognized symptoms of deficiency diseases or a failure to attain the best degree of efficiency and health.

(2) An adequate diet for an adult, each day:

(*a*) *Milk.*—One pint of fluid milk, or its equivalent.

(*b*) *Leafy, green, or yellow vegetables.*—One or more servings.

(*c*) *Tomatoes, oranges, grapefruit, or cabbage.*—One or more servings.

(*d*) *Potatoes, other vegetables or fruits.*—Two or more servings.

(*e*) *Eggs.*—One.

(*f*) *Lean meat, poultry, or fish.*—One or more servings.

(*g*) *Cereals or bread, fats, and sweets.*—As needed to satisfy the appetite. At least part of the cereals or breads should be lightly milled or whole grain.

(*h*) *Water.*—Six or more glasses.

(3) It is preferable to have one raw vegetable and one serving of raw fruit daily. However, in areas in which cholera and dysentery may occur the usual precautions about the use of raw food must be observed.

(4) If available, one serving of fruit should be a citrus fruit. Tomatoes, fresh or canned, take much the same place in the diet.

b. Foods may be classified roughly according to their composition because they are unique or because they are otherwise particularly valuable in the diet. Such a classification aids in analyzing the adequacy of diets when they are considered from the point of view of their use as a major source of particular nutrients, such as the animal foods as sources of good quality protein; milk or its products as a major source of calcium; the leafy green or yellow vegetables important for vitamin A; the meats, cereals, and potatoes as contributors of the B vitamins; and tomatoes and citrus fruits as sources of vitamin C.

c. The quantities after each class of foods represent average amounts used by an active man in a day when receiving a liberal

diet. Marked deviations from these quantities require special consideration to assure an adequate diet.

(1) *Meats, poultry, and fish* (12 ounces).—(*a*) These supply good protein and are valuable as sources of iron, phosphorous, and other minerals and vitamins B_1 and nicotinic acid. Liver, kidney, and heart are richer in iron and vitamins than muscle meat and should be used frequently.

(*b*) Fish may be used fresh, dried, salted, or canned. If meat, fish, or poultry are not available, serve eggs, cheese, beans, and peas.

(2) *Eggs* (1 egg or 0.5 ounce dried whole egg).—Eggs are next to milk in nutritional importance. They are valuable sources of good protein, iron, vitamin A, and vitamin G or B_2. If fresh eggs are not available, use dried whole eggs.

NOTE—(*a*) *General rules for using powdered eggs.*

1. For cakes, cookies, etc., the dry powdered egg is most satisfactory creamed with the shortening. The liquid content is then increased by 1 tablespoonful for each tablespoonful of powdered egg used.
2. For puddings, muffins, etc., the dry powder is mixed with the sugar, and the liquid content increased by 1 tablespoonful for each tablespoonful of powdered egg used.
3. In omelets, souffles, scrambled eggs, the whole egg or yolk powder may be dissolved in either milk or water.
4. To whip whites, put water in bowl, add powdered egg and salt, and stir to mix; then beat.
5. For meringues, beat egg white powder dissolved in water to soft peak, then start adding sugar and continue beating until a stiff peak forms.
6. For chiffon pies, the whites may be dissolved in fruit juice, thus adding additional flavor to pie.

(*b*) *Proportions.*

1 yolk equals 1½ tablespoonfuls yolk powder plus 1 tablespoonful water.

1 white equals 1 tablespoonful egg white powder plus 2 tablespoonfuls water.

1 whole egg equals 2 tablespoonfuls whole egg powder plus 2 tablespoonfuls water.

Add powder to liquid and stir well until smooth.

(3) *Milk* (the equivalent of 1 pint).—Milk contains a variety of nutrient substances, and it is very difficult to construct a diet adequate in calcium without some form of milk or cheese.

(*a*) *Fresh milk.*—Unless absolutely sure that the milk has been adequately pasteurized and properly handled to prevent contamination after pasteurization, bring all fluid milk to a boil before using.

(*b*) *Canned evaporated milk.*—Canned evaporated milk is sterile and when diluted with an equal quantity of water has approximately

the same nutritive value as fluid milk. Water should be boiled and cooled when used to dilute evaporated milk.

(c) *Dried milk.*—One pound of dried skim milk plus one-half pound of butter is the approximate nutritional equivalent of 5 quarts of fluid whole milk.

(d) *Cheese.*—Cheese may be counted as part of the milk allowance. Five ounces of American cheddar or other hard cheese is almost equivalent in food value to 1 quart of milk.

(e) *Substitutes.*—If milk is not available, an adequate supply of calcium should be assured by an increased consumption of green leafy vegetables, beans, and, if necessary, calcium (lime) salts.

NOTE.—Cream soups are very desirable because of the added milk and may be made of almost any vegetable. Cook the vegetables until tender in a small amount of water. Use this water and rub the vegetable pulp through a sieve, combine with hot milk thickened with flour, season, and serve hot.

(4) *Fats* (2.5 ounces).—Fats are concentrated sources of energy. Butter produced when cows are eating fresh green food, commonly called summer butter, is an excellent source of vitamin A. If butter is not available, a butter substitute fortified with vitamin A is to be preferred. Otherwise, any edible fat or oil may be used, but it is then especially important to secure an adequate intake of whole milk or leafy green and yellow vegetables.

(5) *Bread, flour, and cereals* (8 ounces).—Cereals and breads are most important as sources of energy and vegetable protein and *may be consumed in any quantity to satisfy the appetite, provided other nutritional requirements are first met.* The less refined the cereal the better its mineral and vitamin content. Whole grain products (such as rolled oats, cracked wheat, whole wheat, rye, and corn meal) are one of the good sources of the daily requirement of vitamin B_1, while white bread contains very little. Whole grain products are not so essential if the diet contains an abundance of vegetables, fruits, milk, and meat. Only white flour is being furnished because of its keeping qualities.

(6) *Dried beans, peas, and other legumes* (0.5 ounces).—These contain protein and a moderate amount of calcium and vitamin B_1 and may be used as the main dish several times a week. It is not necessary to use the quantity mentioned each day. They may be used in larger quantities at irregular intervals. Because of their tough outer skin, beans and peas sometimes cause indigestion. This difficulty may be avoided by rubbing them through a sieve.

(7) *Sugar* (4 ounces).—Pure sugars do not contribute anything but energy. Heavily sweetened foods should be taken only at the

end of a meal; otherwise, they dull the appetite for more nutritious foods. Crude sugars, such as molasses and sorghum, supply some minerals as well as energy, and are therefore to be preferred.

(8) *Leafy green and yellow vegetables* (7 ounces).—(*a*) These are necessary for their minerals, vitamins (especially provitamin A) and for bulk, which has a laxative value.

(*b*) If there is no danger of cholera, dysentery, typhoid, etc., raw vegetables and fruits are desirable. Cabbage, carrots, turnips, and onions are usually available and may be used raw in salads.

NOTE.—Fresh vegetables should be cooked in a minimum amount of water and only long enough to soften the fiber. Vitamin and mineral loss is reduced to a minimum when vegetables are steamed. It is preferable to cook vegetables with the skins on. Soda should not be added, since this destroys all of the vitamin C. Juices drawn out in cooking or water added in cooking contain valuable nutrients and should not be discarded. Properly canned vegetables are about the equivalent, nutritionally, to freshly cooked vegetables. In this case, also, the liquid should be used.

(9) *Tomatoes and citrus fruits* (5 ounces).—Tomatoes and citrus fruits are especially valuable fresh, cooked, or canned because of their high vitamin C conent, and should be eaten every day. Cabbage and turnips are also good sources of this vitamin.

(10) *Potatoes* (8 ounces).—Potatoes are especially valuable because they are usually available in large quantities, inexpensive, and can be eaten day after day. They supply iron and vitamins B_1 and C. If potatoes are not available, substitute 2 ounces of cereals and increase the intake of other vegetables.

(11) *Other vegetables* (8 ounces).—Other vegetables add to the vitamin and mineral content of the diet and provide bulk.

(12) *Fruits* (canned and fresh, 8 ounces; dried, 1 ounce).—Fruits have roughly the same nutritive value as the root vegetables. Berries of all kinds, cherries, apples, peaches, pears, and melons add to the vitamin and mineral content of the diet. If fresh fruits and vegetables are not available, properly canned or dried fruits may be substituted. Dried prunes, apricots, peaches, apples, raisins, and dates may be used, but they have lost some of their vitamins.

(13) *Coffee, tea, chocolate, etc.*—As desired.

(14) *Diet fortifications and concentrates.*—(*a*) Debittered dried brewer's yeast powder to meet certain vitamin requirements when the intake of meats and legumes is deficient may occasionally be ordered by a medical officer.

(*b*) Dried yeast is not soluble in water. It may be stirred into milk, tomato juice, or eggnog or mixed with peanut butter. However, it settles quickly and hence must be taken promptly after mix-

ing. In order to avoid lumping, the liquid should be added to the yeast while stirring. It may also be sprinkled on cooked cereals, mashed potatoes, etc. However, since dried yeast is not always palatable, it is better not to spoil the flavor of the total food, but to take the yeast as a medicine mixed with a small amount of food.

332. Planning meals.—*a. General.*—The objective in planning meals is to obtain a combination of foods and methods of preparation that will satisfy the habits and desires of the members of the mess and, at the same time, furnish an adequate diet. The number of foods available is relatively limited. It is necessary, therefore, to obtain variety and interest in meals by changing the method of preparation or the combination of foods. Surprise is an important factor in maintaining interest. Monotony in menus or the periodic repetition of meals, especially at weekly intervals, results in dissatisfaction even with the most interesting foods. Numerous factors influence the appetite, especially the weather and amount of exercise. Use the periods of increased appetite to encourage the consumption of foods that are needed but not particularly relished. Anticipation of coming events, whether pleasurable or otherwise, affects the men's interest in food. Study the habits of the members of the mess and the progress of events as an aid in planning meals. Use the interesting foods or ways of preparation to keep men satisfied, but use them intelligently, especially when the supply of foods is limited.

b. Breakfast.—(1) The breakfast is built around meat or eggs, cereal, milk, and bread, with coffee or cocoa for a drink. Fruit is desirable. It should not, however, be reserved for use at breakfast if it is more useful in improving the other meals. It is desirable to add a spread of some kind, such as butter, syrup, or a jam or gravy, to aid in the consumption of bread. If dried fruits are used for breakfast, they can often be prepared as a jam and used as a spread. The bread may be the ordinary baker's bread or it may be some special bread such as raisin bread, corn bread, whole wheat bread, biscuits, graham muffins, muffins with sugar frosting, wheat cakes, doughnuts, etc., or toast (it is practical to prepare toast in the oven).

(2) Eggs, sweets, etc., are most effective when used in the preparation of special breads which will not require as much spread, if any, for their consumption, as the straight wheat bread. It is often desirable to prepare meat and eggs in such form that they stimulate the consumption of either cereal or bread; for instance, frizzled dried beef gravy on bread or toast, creamed hard boiled eggs, etc. On the other hand, variety and interest in food is maintained by the use of meat and eggs.

c. Dinner.—(1) The dinner is built chiefly around the meat, potatoes, and the leafy green or yellow vegetables. The flavor of the meat may be extended by preparing dishes in which meat is in combination with other foods. Special care must be taken in the preparation of combinations of meat with a vegetable or carbohydrate foods, since such mixtures when kept overnight in a refrigerator are likely to spoil. This means that any combination with meat should be prepared fresh each day or at least the combination should be made on the day it is to be used. The combination of meat with vegetables and bread in the form of meat loaves, stews, hashes, or scalloped dishes are valuable ways of adding variety to the meals. Such combinations are also useful ways of promoting the consumption of vegetables that some men do not relish. Gravy is an important part of any roast or fried meat; it is often as important as the meat itself.

(2) In addition to meat, it is customary to serve potatoes and a leafy green or yellow vegetable unless they have been combined with some other dish. A dessert may be used at noon or at night, or both, depending upon the character of the meal. When supplies are restricted, if the meal is particularly attractive at noon because of the combination of foods or the use of clear meat, it is sometimes desirable to postpone the dessert until the evening meal when the main dish may not be so attractive.

(3) The selection of the mode of preparation of food must take into consideration the consistency of the other dishes of the meal. Do not make all of the dishes of a soft or of a hard texture. Include some firm or crisp foods with the soft and vice versa. For example, do not have all boiled foods or creamed dishes at one meal. Toast or croutons help soups.

d. Supper.—(1) The supper may or may not contain meat, depending upon the supplies available. The main dish may contain some meat or cheese or tomatoes combined with macaroni, spaghetti, rice, or beans, or in combination with one or more root or leafy green or yellow vegetables. Sauces of different kinds add to the variety of such dishes. In addition, it is desirable to have a second leafy green or yellow vegetable, preferably an uncooked vegetable in the form of a salad based on cabbage as cole slaw, cold cooked string beans, or a combination fruit and vegetable salad. A good fruit salad may often take the place of dessert when facilities for service are restricted. Occasionally raw onions are desirable, as well as a direct serving of cold tomatoes. A dessert may be a special bread, bread

or other pudding, cake, or fruits, especially fruits in season. Potatoes may or may not appear at this meal.

(2) It is not desirable to reserve all of the main dishes made of macaroni, spaghetti, beans, etc., for one meal. They should be divided occasionally between the noon meal and the evening meal. It is just as important to have a good supper occasionally as it is to have a good dinner. Moreover, the changing between two meals adds a certain amount of variety.

(3) Coffee, tea, cocoa, or occasionally lemonade may be the drink at dinner or supper. Always supply water.

e. Comments.—(1) At dinner and supper combinations of food, if carefully prepared with particular attention to their palatability, are economical and offer variety. Among such dishes are stews; macaroni and spaghetti dishes combined with cheese, meat, or tomatoes; scalloped potatoes combined with meat or bacon; and meat loaves made with bread and/or vegetables. Meat, fish, and vegetable chowders are also very good.

(2) Individual dishes, such as meat pies, have been successfully served under suitable conditions.

(3) Soups can be used effectively if well flavored. They may help to increase the consumption of vegetables, especially if the vegetables are finely divided.

(4) Particular attention should be given to the proper service of food. Such service includes a moderate quantity of food carefully placed on the plate. If more food is needed, additional helpings can be given. Such type of service, to be successful, must be uniform for all men. Complete satisfaction of the appetite is to be obtained through repeated helpings, provided the previous food has been eaten. Garnishing of foods is possible at the service table in cafeteria service, such as sauce over the meat, spaghetti, etc. Bread crumbs browned in fat placed over macaroni adds to its attractiveness and makes it more palatable.

(5) In the preparation of stews, etc., there are two ways of preventing overcooking of vegetables:

(*a*) Cook the vegetables separately and not quite done, and then add to the meat a short time before the food is to be served. They will finish cooking in the hot meat, especially if the mixture is brought up to cooking temperature.

(*b*) Add the vegetables late in the process of preparation so that they will just be done when the food is served.

(6) Holding the food for a long time in kettles results in a deterioration of their nutritive value as well as their palatability. The

final preparation of foods, especially the vegetables, should be delayed as long as possible. When there are two messes it is better to start the food for the second mess after that of the first one so that it will just be done when it is to be served. Satisfactory preparation calls for careful planning.

(7) In preparing food for stews or vegetables for soups or for cooking for the table, especially the roots, meat, and vegetables, exclusive of potatoes, it is desirable that the food be cut into small pieces; for roots about ½ to ¾ of an inch on a side, and for meat from ¾ to 1½ inches. In preparing meat it is desirable to remove excess fat, connective tissue that is not ordinarily eaten, and other nonedible parts before the food is sent to the kitchen. Such trimmings are ordinarily not eaten at the table and are a waste if served, whereas if removed in the meat room they may be rendered for fat.

(8) In cooking in steam kettles, it is well to remember that once the food is well heated throughout, the heat in the mass of food is enough to complete the cooking of many foods with very little additional heat. Guard against rapid, continual heating of foods that do not require long cooking. Even meat, once it is seared, will cook thoroughly at a low heat, but it takes a longer time.

(9) Try new ideas.

333. Fundamentals of cooking.—*a.* The details of cooking must be learned in the kitchen, where the technique of performing the various operations is obtained by actual experience. The necessity for a rotation of duty assignments in many hospitals requires the training of a number of the personnel in the fundamentals of cooking and diet.

b. Effective cooking takes into consideration the characteristics of cereals, vegetables, fruits, spices, and meats, such as nutritive value and how to retain it, changes in texture and flavor that occur, the functions of foods and leavening agents in food preparation, and the possibilities of combining foods to obtain variety and increased palatability. The varied conditions under which the soldier must operate require care, ingenuity, attention to detail, willingness to meet emergencies, and application of fundamental principles if a satisfactory, economical, and adequate diet is to be produced with the foods and facilities available. Since a large part of the success of hospital diets depends upon the interest they create in the patient, factors of palatability are even more important than with well-fed active men.

c. Variety in food and method of preparation are the means of creating and maintaining interest in food or a satisfactory mess.

The number of foods is limited. Variety must be obtained by different methods of heating—baking, boiling, frying, sautéing; by different methods of preparation—whole, sliced, mashed, purées, soups; by combination in cooking—hashes, stews, pot pies, cakes; and by combination of foods or sauces in serving—meat or tomato sauces, pudding sauces, salad dressings, croutons. Cookbooks are valuable aids in food preparation.

d. Time and temperature are important in food preparation and service. Food served when it is just ready is more attractive than underdone or overdone food. Hot foods should be served hot and cold foods cold. Lukewarm or indifferent foods are not attractive. Careful planning and experience is required to have everything come out just right and on time.

e. Waste of food must be carefully avoided. Grease and drippings should be reserved for cooking. The juice from boiled vegetables should be served with them when possible; otherwise, saved for soups.

f. (1) All foods undergo decomposition fairly rapidly. Protein-rich foods, especially animal foods, are likely to putrefy and may develop toxic products.

(2) It is essential to take especial care of fresh foods. Putrefaction results from the growth of bacteria. Such growth requires the presence of heat, moisture, and organic matter; if any one of these conditions is absent, putrefaction is retarded. Hence, meats kept well when frozen (absence of suitable temperature), when dried (absence of moisture), canned (absence of bacteria which have been destroyed or retarded by heat), or when pickled (absence of bacteria and molds, which have been killed by high concentrations of salts and condiments and often by cold). The handling of food introduces bacteria. In addition, the removal of refrigerated food to the kitchen to work on it or mixing perishable food with warm food allows bacteria to develop. For this reason refrigerated food should be kept in the refrigerator as much as possible. Hashes and salads containing meat, poultry, or milk must be mixed just before cooking, and should be served soon after they are done or ready to serve. They should be prepared in amounts that will be consumed so that there will not be left-overs which may stand in warm dining rooms to allow bacteria a chance to grow.

g. A clean kitchen and clean cooking utensils scalded with hot water (as with table dishes, knives, forks, and spoons) are a safeguard to the health of troops.

h. Cooking destroys bacteria and molds, improves flavor and texture of food, and thus appeals to the appetite. New flavors are

developed and proteins coagulated in meats; starch granules are broken down in vegetables; hard fruits and vegetables are softened; gases are liberated, held, expanded, and fixed in bread and cakes to give them lightness. The ordinary processes of cooking represent different ways of applying heat to food. They are boiling, braising, stewing and simmering, roasting, baking, frying, steaming, and broiling or grilling.

(1) *Boiling.*—(*a*) In boiling, food is subjected to the action of boiling water. It is impossible to obtain higher temperature in the food than that of the water. Water boils at 212° F. at sea level and at lower temperatures at higher altitudes.

(*b*) Meats should be simmered, not boiled, that is, cooked just below the boiling point, 180° to 210° F. at sea level. No particular advantage is attained by beginning boiling or simmering in hot water provided the temperature is brought up quickly, except to facilitate the rate of cooking.

(*c*) Vegetables should be cooked in as small amounts of water as possible, and only long enough to make them desirably tender. Vegetables are too often overcooked, with resultant loss of flavor and texture and, what is more serious, destruction of vitamins. The cooking water contains valuable minerals and salts—it should be used in soups or served.

(*d*) Potatoes should be boiled in their jackets because much of the vitamins and minerals are retained.

(*e*) Beans, peas, rice, and other hard legumes and grains require a preliminary soaking; the legumes (beans, peas, etc.) do not soften satisfactorily on cooking in hard water.

(2) *Baking or roasting.*—(*a*) In baking, food is cooked by indirect heat, usually in an oven or upon heated metal. Roasting is the term usually applied to the baking of meats. The time required to cook meats depends upon a number of factors of which the degree of doneness, the temperature of the oven, the size of the piece of meat and, to a certain extent, the fatness of the meat are important. Well done meat requires a longer time than rare meat; a hot oven cooks faster than a moderately hot oven; a large piece of meat requires longer to cook than a small piece because of its size, but less time per pound; fat meats tend to roast more rapidly than lean meats. Meat can be cooked well done at any reasonable oven temperature, although the best results are obtained with a moderate to low oven temperature because the meat is cooked more evenly than in a very hot oven. Furthermore, it has more juice and yields more servings. It is not necessary to sear meat before cooking except to develop flavor in the

outer surface. High temperature helps to develop flavor in the pan juice after meat is done.

(*b*) The gravy of roasted meats plays an important part in satisfactory meals. A good gravy is as important as well roasted meat. When meat is roasted at low temperatures, flavor may be developed in the gravy by heating it in the roasting pan, and color by adding flour before heating.

(3) *Braising.*—In braising, meat is browned in a hot receptacle with a small amount of fat. It is then cooked slowly in the juices from the meat or in added liquid in a covered utensil. The added liquid may be water, milk, meat stock, diluted vinegar, or the juices of vegetables. The preliminary browning is to develop flavor in the meat.

(4) *Broiling and frying.*—Broiling and frying accomplish roughly the same purpose—to cook food, especially meats, quickly and at the same time to develop flavor. In *broiling*, food is cooked by radiant (direct) heat from hot coals or gas flame. In *frying*, food is cooked in a deep layer of fat; it is also called deep-fat frying. *Sautéing.*—Cooking in an open pan with a small amount of fat is called *sautéing.*

(5) *Steaming.*—In steaming, food is cooked in steam with or without pressure. When pressure is used higher temperatures are obtained and the food, therefore, cooks more rapidly. Vegetables cooked in low pressure steamers do not lose their vitamin and mineral content to the surrounding water as in boiling. When cooked under pressure vitamins affected by heat are destroyed to a greater extent than in low pressure or low temperature cooking.

(6) *Fricassee.*—Fricassee is a dish made of fowl, veal, or other meat cut in pieces and served, often with vegetables, in gravy. Braising is the method used in making a fricassee.

334. Preparation of vegetables.—*a.* All vegetables require careful washing. Only thick-skinned vegetables require paring. Damaged or decayed parts should be discarded. Discolorations which sometimes occur on the cut surface may be avoided by placing the vegetable in water to exclude the air, although long soaking may result in a serious loss in nutritive value. Soaking wilted vegetables in cold water restores their crispness. If cauliflower and cabbage are to be cooked whole or quartered, they should first be soaked in cold dilute salt water (1 teaspoonful of salt to 1 quart of water) for one-half hour to drive out insects. Dried vegetables such as peas and beans are best when soaked overnight in soft water.

b. So far as possible vegetables should be so prepared as to maintain both food value and palatability. The methods of cooking

affect the flavors of vegetables in different ways and must be chosen with care. The texture of the cooked vegetable should be tender but still firm. Overcooking causes flabby, soft, or mushy texture. Since the color of vegetables adds to their attractiveness, a method of preparation should be selected which will retain so far as possible the characteristic color.

c. Loss of food value in cooking vegetables is caused by dissolving some of the food materials in the cooking liquid, and by chemical changes in some of the constituents. The fact that some of the nutritive material dissolves in the cooking liquid makes no particular difference in food value if this liquid is served with the vegetable or is used in making soups or sauces, but the mineral content of the diet may be seriously reduced if vegetable juices are repeatedly drained away. Since it is not always feasible to use excess cooking liquid, it is well to cook vegetables by methods that require very little added water or none at all.

d. Some of the valuable food constituents of vegetables dissolve in water more readily than do others. Sugars, the vitamins, and mineral salts are especially soluble, and the amount dissolved in the cooking water is increased if a large amount of liquid is used, if much cut surface is exposed, and if the time of cooking is prolonged.

e. Vitamins A, B, and C are the ones most likely to be lost in cooking. The loss of vitamin C is especially large. This vitamin is exceedingly unstable and is not only lost by solution in the cooking water but may also be destroyed by heating, especially in the presence of oxygen from the air, the cooking water, or the vegetable tissue itself. The destruction is less rapid in acid foods like tomatoes. Studies show that short cooking at the boiling point or just below is less destructive of vitamins than is longer cooking or cooking at a higher temperature. Holding food hot tends to lower vitamin content.

f. The characteristic flavor of each vegetable depends upon the acids or acid salts, tannins, sugars, and essential oils that the vegetable contains. These flavoring substances may be broken down, dissolved, decomposed, or volatilized during cooking. Less flavorful materials, such as starch, may contribute definite flavor when chemically changed by heat. Baking and deep-fat frying are outstanding examples of specific methods of preparation that have an effect on flavor. The high temperature of the oven in one case, and of the fat in the other, causes some of the starch of the vegetable to brown or dextrinize and some of the sugar to caramelize, developing characteristic flavors.

g. The addition of salt keeps the natural flavor, while fats and various sauces modify it. Other seasonings, such as pepper, curry powder, nutmeg, and cinnamon improve the taste of some vegetable dishes. Blended flavors are developed by cooking vegetables in combination. Well known and favorite combinations are peas and carrots, tomatoes and celery, beans and corn, and mixed greens.

h. Vegetables should be cooked in the shortest time possible, since overcooking is harmful to texture and appearance as well as to food value and flavor. A firm though tender texture is desired.

i. Baking a vegetable in its skin retains practically all of its mineral content, causes very little destruction of vitamins, and develops flavor. Such vegetables as potatoes, squash, cucumbers, tomatoes, and onions lend themselves readily to baking because they contain enough water to form steam and keep them moist, the skin holding in the steam as it forms.

j. Steaming—that is, cooking in live steam—is the second-best method for vegetables from the viewpoint of food value. Much more of the soluble mineral material is conserved than in boiling, and the vegetable retains its original shape. Steaming is well suited to the cooking of carrots, squash, beets, parsnips, sweetpotatoes, wax beans, and many other vegetables. The exceptions are vegetables containing green pigment, but some of these—spinach, for example, and other thin green leaves—may be prepared by steaming if too-large quantities are not cooked at one time. Steamed vegetables may be salted either at the beginning of the cooking or just before they are served.

k. Steaming under pressure, as in the pressure cooker, shortens the cooking time of vegetables such as dried peas and beans that require long periods of cooking by other methods. This method is not recommended for fresh vegetables, however, because it destroys some of the vitamins and causes undesirable changes in color, flavor, and texture.

l. (1) Boiling is the most common method of cooking vegetables. The food value of boiled vegetables can be conserved if the cooking process is managed properly. Vegetables such as cabbage, turnips, onions, cauliflower, Brussels sprouts, and rutabagas should be boiled gently in only enough water to cover them; green vegetables should be cooked in a very small amount of water. Leaving off the cover of the container permits the volatile acids to escape and aids in preserving the color, especially of green leafy vegetables, peas, and beans, but also allows some loss of flavor. In cooking vegetables the color and flavor of which are not easily affected, nutritive

TABLE I.—*Time required for cooking the more common vegetables by different methods.*

Vegetable	Quantity as purchased required for 5 or 6 servings		Preparation for cooking	Time of cooking when vegetables are—		
				Baked	Steamed	Boiled
		Lbs.		*Hrs.*	*Mins.*	*Mins.*
Artichokes, globe or French	6 medium-sized	3	Whole			35
Artichokes, Jerusalem		1½	Pared, whole	½–1	35	30
Asparagus	2 bunches	1½–2	In bunches			15–20
			1½-inch pieces		12	12–15
Beans, Lima, dried	1 cup	⅜	Soaked overnight	6–8		180
Beans, Lima, fresh		4, in pods.	Shelled			30
Beans, navy, dried	1 cup	⅜	Soaked overnight	6–8		180
Beans, snap		1½–2	In pieces		[1] 25–30	20–30
Beet greens		3	With stems			15–20
			No stems			10
Beets, mature		2	Whole			60–90
Beets, young	2 bunches		do		60	30–45
Broccoli	1 large bunch	2–2½	Cut in strips			20–25
Brussels sprouts	1 quart	1¼	Whole			15–20
Cabbage	1 small head	2	Quartered		15	10–15
			Shredded		10	5–10
Carrots, mature		1½	Diced or sliced		25–30	20–25
Carrots, young	2 bunches		Whole		20–30	15–20
Cauliflower	1 medium head	2–2½	Separated		10–15	10–15
			Whole		25–30	20–30
Celeriac	6 medium-sized	2½	Diced		25	15–20
Celery	1 large bunch	2	1½-inch pieces		25–30	15–20
Chayotes	3 medium-sized	1½	Sliced		20	15
Collards		3			30	20
Corn	6 ears		On cob		10	6–15

Dandelion greens		2				10–20
Eggplant	2 small or 1 large	2	Diced		15	10
Fennell	6 medium-sized	2½	1½-inch pieces		25	15–20
Kale		2–3				20–25
Kohlrabi	6 medium-sized	1½	Pared, sliced		30	25–30
Lentils, dried	1 cup	⅜	Soaked overnight	6–8		180–240
Mushrooms		1½	Whole	¼		5 (in own juice)
Okra		1½	do		20	10–20
Onions, Bermuda	6 medium-sized	1½–2	Peeled, whole	1		30
Onions, Spanish	3 medium-sized	2	Peeled, cut in half	1		35–40
Parsnips	6 medium-sized	1½	Whole	½–¾	30–40	20–30
Peas, dried	1 cup	⅜	Soaked overnight	6–8		180
Peas, fresh		3, in pods	Shelled			10–20
Potatoes	6 medium-sized	1½–2	Whole	¾	40	35
Rhubarb	1 large bunch	2	1-inch pieces	¼	5	5
Rutabagas	2–3	2	Pared, quartered			20–30
Spinach		2–3	With stems			10
			No stems		5–6	5–8
Squash, summer	3–4	3	Pared, sliced		20	15
Squash, winter		3	2-inch pieces	¾–1	30–40	20
Sweetpotatoes	6 medium-sized	1½	Whole	¾	30–35	25–30
Swiss chard		2	With stems			20–30
			Leaves alone [2]			10
			Stems alone [2]			30
Tomatoes	6 medium-sized	1½–2	Quartered	½–¾		10–20
Turnip greens		2–3				20–30
Turnips	2 bunches	2	Sliced or diced		20–25	15–20
Vegetable oyster, or salsify	1 large bunch	1½	Sliced		20	20

[1] Green beans lose color on steaming.

[2] Cooked separately but combined for serving.

losses may be prevented by leaving the cover on and using as little water as possible. Salt may be added in the approximate proportion of 1 level teaspoonful to a quart of boiling water. Any leftover stock should be served with the vegetable or utilized in sauces or soups.

(2) If water is actually boiling when vegetables are put into it, and if it is kept boiling gently throughout the cooking period, considerable time is saved. If tough stems of leafy vegetables are removed the cooking period is about halved and the vegetable undergoes small loss of food value.

m. The approximate length of the cooking period for the more common vegetables is given in table I. The time required varies with the tenderness of the vegetable and the form in which it is cooked as well as with the method of cooking. The time can be shortened in different ways.

n. A vegetable is considered sufficiently cooked when it is tender, but not soft and flabby. The time required under those methods most appropriate to the vegetable is given in table I.

335. Breadmaking.—See TM 10-410.

336. Hospital diets.—*a. Medical diets.*—Diets are classed as liquids, semisofts, softs, and lights, based on the degree of digestibility and are given to the patient according to his tolerance for food. A medical liquid is fluid, bland, easily digested, and has a low residue. For a semisoft diet add a few of the most easily digested solids to the liquid diet. The soft diet consists of very digestible solids with the addition of stewed fruits and vegetables in the form of purées. The light diet is practically a normal diet with all fried, highly seasoned, and indigestible foods omitted. The following outlines of foods may be used for each diet.

(1) *Liquid diet.*—(*a*) *Foods.*—Allow 1⅔ pints at each meal with three extra nourishments between meals at 10:00 AM, 2:30 PM, and 8:00 PM.

All usual beverages.	Broths.
Cereal gruels.	Soups (strained).
Milk—in all forms.	Fruit juices.
Wheys.	Ice cream (plain).
Albumins.	Ices (plain).

(*b*) *Sample menu.*

Breakfast	*Dinner*	*Supper*
Orange juice.	Broth.	Broth.
Oatmeal gruel.	Vanilla ice cream.	Lemon albumin.
Coffee.	Milk.	Cocoa.

10:00 AM	*2:30 PM*	*8:00 PM*
Eggnog.	Ginger ale with ice cream.	Milk.

(2) *Semi-soft diet.*—(*a*) *Foods.*—Allow 1⅔ pints of food at mealtime with nourishments between meals at 10:00 AM, 2:30 PM, and 8:00 PM.

Cooked cereals: Oatmeal (well cooked), Farina, Cream of Wheat, Cerevim, Pamlum—avoid those high in roughage.
Milk toast.
Crackers in milk.
Eggs: Coddled, poached, soft-boiled, soft-scrambled.
Custard: Baked or boiled.
Puddings: Blanc mange, tapioca, simple cream puddings, plain gelatin desserts.
Junket.

(*b*) *Sample menu.*

Breakfast	*Dinner*	*Supper*
Orange juice.	Broth.	Strained vegetable soup.
Cream of Wheat.	Milk toast.	Crackers in milk.
Soft-boiled eggs.	Baked custard.	Junket.
Coffee.	Tea.	Cocoa.

10:00 AM	*2:30 PM*	*8:00 PM*
Malted milk.	Ginger ale with ice cream.	Milk.

(3) *Soft diet.*—(*a*) *Foods.*—Give small, attractive servings. The following foods may be added to the above lists:

Fruits: Oranges, stewed fruits (without seeds), baked apple, canned peaches or pears.
Cereals: Prepared (not high in roughage).
Toast: Zwieback, rusks, toasted white bread.
Chicken: White meat (sliced, scalloped, creamed, etc.).
Eggs: Any way except fried or hard-boiled.
Crackers: Soda.
Brains: Creamed, scalloped (plain or with eggs).
Sweetbreads: Creamed, scalloped, or broiled.
Fish: White (baked, boiled, broiled).
Oysters: Broiled, creamed, scalloped, stewed.
Potatoes: Baked, mashed, riced.
Macaroni: Spaghetti, noodles, and rice.

Asparagus tips.
Celery: Creamed or stewed.
Vegetable purées: Beets, carrots, lima beans, peas, squash, spinach, string beans.
Cheese: Cream and cottage.
Fruit whips.

(b) *Sample menu.*

Breakfast	*Dinner*	*Supper*
Sliced orange.	Strained cream of celery soup.	Strained vegetable soup.
Cream of Wheat.	Sliced white meat of chicken.	Buttered asparagus on toast.
Poached egg on toast.	Mashed potatoes.	Baked potato.
Coffee.	Purée peas.	Purée carrots.
	Toast and butter.	Toast and butter.
	Prune whip with custard sauce.	Junket.
	Milk.	Cocoa.

(4) *Light diet*—(a) *Foods.*—In addition to all foods listed above the following may be given:

Fruits: Fresh (except bananas and melons) and canned or stewed fruits.
Cereals: All except very coarse cereals. (See semi-soft diet list.)
Crisp bacon.
Scraped beef.
Lamb chops.
Liver, scalloped or souffléed.
Poultry.
Fish (except pickled or fried).
Vegetables: Raw or cooked. Coarse or strong vegetables must be omitted.
Bread: White, graham, whole wheat.
Simple puddings.
Sponge cake.
Wafers.
Simple salads.

(*b*) *Sample menu.*

Breafast	*Dinner*	*Supper*
Sliced orange.	Cream of celery soup.	Vegetable soup.
Cream of Wheat.	Scraped beef cakes.	Buttered asparagus on toast.
Poached egg on toast.	Mashed potatoes.	Baked potato.
Crisp bacon.	Buttered peas.	Lettuce salad with mayonnaise.
Coffee.	Bread and butter.	Bread and butter.
	Prune whip with custard sauce.	Junket.
	Milk.	Cocoa.

b. Surgical diets.—(1) *Preoperative treatment.*—As prescribed by the surgeon.

(2) *Postoperative treatment.*—The surgeon may prescribe the following:

(*a*) *Abdominal cases* (except stomach and small and large intestines).

1. First day.—After 8 hours, if there is no nausea, allow the patient tea and tap water.

2. Second day.—Give four 8-ounce feedings of tea, tap water, and broth.

3. Third day.—Give a surgical liquid diet after the oil is effective.

4. Fourth day.—Soft diet. After this period a regular diet is allowed at the discretion of the ward officer.

(*b*) *Stomach cases* (small intestines and colon).

1. First, second, and third days.—Give the patient nothing by mouth. Use the Murphy drip 2 hours on and 2 hours off (except in colon cases).

2. Fourth day.—Allow 1-ounce quantities of tea, tap water, whey, and strained orange juice every half hour.

3. Fifth day.—Increase the same liquids as above to 4 ounces every 2 hours.

4. Sixth day.—Add orange, albumin, and clear, nonirritating broths.

5. Seventh day.—Add cereal gruels to the diet. Malted milk and junket are given only when ordered by the doctor.

(*c*) *Gall bladder cases.*

1. First, second, and third days.—Follow the routine of abdominal cases.

2. Fourth day.—Semi-soft diet is given. Milk, cream, and lemon must be restricted.

3. *Fifth day.*—Give a soft diet, gradually introducing butter and cream. Restrict milk, cream soups, cocoa, and eggnogs. After the fifth day additional diet orders should be given by the ward surgeon. On a regular gall bladder diet restrict gravies, fried foods, pastries, gaseous vegetables, and all salads.

(*d*) *Liquids.*

Broths.	Coffee.
Bouillon.	Whey.
Beef tea.	Albumin.
Beef juice.	Fruit juices.
Tea.	Ginger ale.

Avoid milk in any form.

Liquid diet should be administered every 2 hours from 7 AM to 8 PM.

(*e*) *Semi-soft.*

1. *Foods.*—Useful in transferring ill cases from liquid to solid foods. Feedings six times daily. From 500 to 600 grams at meal time with 200 cubic centimeters between meals may be allowed.

Liquids of all sorts.
Broth: Thickened, strained.
Soups: Thickened, strained.
Eggs: Poached, coddled, soft-boiled.
Poultry and beef jellies.
Cottage cheese.
Plain gelatins.
Fine cereals.
Oatmeal: Strained.
Tapioca.
Junket.
Custards.
Blanc manges.
Plain sherbets.
Plain ice cream.

2. *Sample menu.*

Breakfast	*Dinner*	*Supper*
Orange juice.	Broth.	Broth.
Cream of Wheat.	Baked custard.	Jello.
Coffee.	Tea.	Tea.
10:00 AM	*3:00 PM*	*8:00 PM*
Eggnog.	Lemonade.	Milk.

(*f*) *Soft.*

1. *Foods.*—Food six times daily. Carefully guard total amounts.

Any liquid or semi-soft foods.

Cream of Wheat, Quick oats, Cerevim, Pablum (cooked cereals).

Toast.

Butter.

Apples: Stewed or baked (no skin).

Purée stewed fruits.

2. *Sample menu.*

Breakfast	*Dinner*	*Supper*
Purée prunes.	Broth.	Broth.
Cream of Wheat.	Cottage cheese.	Poached egg on toast.
Toast and butter.	Toast and butter.	Jello.
Coffee.	Baked custard.	Tea.
	Tea.	
10:00 AM	*3:00 PM*	*8:00 PM*
Orange juice.	Lemonade.	Fruit juice.

(*g*) *Light.*

1. *Foods.*

Potatoes: Mashed or baked.
Stewed celery.
Asparagus tips.
Spinach.
Beets.
Carrots.
String beans.
Peas.
Macaroni, spaghetti, noodles.
Brains.
Bacon: Broiled.
Chicken.
Sweetbreads.
Lamb chops.
White fish.
Oysters.
Stewed and canned fruits (except pineapple, figs, and raisins).
Oranges.
No salads, raw vegetables, or raw fruits (except oranges).

2. *Sample menu.*

Breakfast	*Dinner*	*Supper*
Stewed prunes.	Chicken broth.	Cream celery soup.
Cream of Wheat.	Broiled lamb chop.	Buttered asparagus with toast points.
Poached egg on toast.	Mashed potatoes.	Baked potato.
Broiled bacon.	Buttered string beans.	Buttered carrots.
Coffee.	Toast and butter.	Toast and butter.
	Baked custard.	Fruit Jello.
	Milk.	Milk.

SECTION V

DENTAL REPORTS AND RETURNS

337. Dental reports and returns.

W. D., M. D. Form No.	Title and description
18b	*Statement of Expenditure of Special Dental Materials.*—Rendered monthly from every military station or separate command where a dental clinic with laboratory facilities is established and a dental officer is in attendance. If post is under the immediate control of the War Department, report is sent directly to The Surgeon General, one copy to the station medical supply officer, and one copy retained. If forwarded through the corps area surgeon, two copies are sent forward, one copy to the medical supply officer of the station, and one copy is retained. (See AR 40-1010.)
18b-L	*Statement of Expenditure of Special Dental Materials.*—Rendered monthly from every central dental laboratory. If the laboratory is under the immediate control of the War Department, report is sent directly to The Surgeon General, one copy is sent to the medical supply officer of the station, and one copy retained. If forwarded through corps area surgeon, two copies are sent, one copy to the medical supply officer of the station, and one copy retained.
57	*Report of Dental Service.*—Rendered monthly from every station and separate command where a dental officer has been on duty during the month. If post is under the immediate control of the War Department, report is sent directly to The Surgeon General; one copy retained. If forwarded through the corps area surgeon, two copies are sent and one retained. (See AR 40-1010.)
65	*Dental Engagement Slip.*—It should be made out for all appointments given for dental treatment. In the case of the enlisted man, it is a request for his relief from other duty so that he may obtain dental treatment at the designated time.
79	*Register of Dental Patients* (*card*).—Prepared for every person receiving dental treatment. (See AR 40-1010.)

W. D., M. D. Form No.	Title and description
123	*Label Penalty.*—This form to be placed on the outside of all cartons used in mailing dental appliances. (See Circular Letter No. 1, compilation of Circular Letters, Surgeon General's Office, January 2, 1940, par. 11.)
124	*Prosthetic Case Record.*—Two copies made at dental clinic and forwarded to central dental laboratory, which retains one copy and returns the other to the dental clinic along with the completed prosthetic appliance.
125	*Caution Slip.*—This form to be placed on all mailing cartons containing dental appliances.
126	*Report of Central Dental Laboratory.*—Case record of all dental appliances constructed at central dental laboratory during the month. One copy is forwarded to The Surgeon General and one copy retained.

SECTION VI

VETERINARY REPORTS, RETURNS, AND RECORDS

338. **Tabulation of reports and returns.**—The following tables include only the reports and returns required by Army Regulations pertaining to the veterinary service:

a. Daily.

Title	W. D., M. D. Form No.	Reference and remark
Veterinarian's morning reports of sick animals.	71V	AR 40-2035. Made after veterinary sick calls. Sent to commanding officer. Returned by adjutant to veterinary hospital.
Morning report of ward	72	AR 40-2065. Forwarded to hospital office.

Title	W. D. M. D. Form No.	Reference and remark
Record and report physical examination of animals for purchase.	109----	AR 40–2265. Filed in office until end of month. On days that no examinations are made, no report is required.
Report of veterinary meat and dairy hygiene and forage inspection.	110----	AR 40–2260. Filed in office. On days that no inspections are made, no report is required.

b. Monthly.

Title	W. D., M. D. Form No.	Reference and remark
Statistical report, third section (personnel and transportation).	86c----------	Section IV, AR 40–2245. Original to The Surgeon General direct; copy to corps area surgeon; copy retained. For rendition and transmission in time of war see Section IV, AR 40–2245.
Report sheet: report of, and register card for, sick and wounded animals.	102 and 115---	AR 40–2245. Original to The Surgeon General through corps area surgeon; copy to corps area surgeon; copy retained for file.
Record and report physical examination of animals for purchase.	109----------	AR 40–2265. Made by assembling chronologically daily reports of examinations. Original to The Surgeon General through military channels; copy to headquarters veterinarian; copy retained.
Report of veterinary meat and dairy hygiene and forage inspection.	110----------	AR 40–2260. Prepared by compiling data from daily reports. Original to commanding officer through the surgeon; copy to quartermaster; copy retained.

c. Quarterly.

Title	Form	Reference and remark
Veterinary sanitary report.	Letter--------	AR 40–2255, AR 40–2090. Original and copy to commanding officer; one copy to station surgeon; one copy retained.

d. Annually.

Title	Form	Reference and remark
Report of corps area veterinarian.	Letter	AR 40–2015. Original to corps area surgeon for transmission to The Surgeon General; one copy retained.
Report of veterinary activities at laboratories.	Letter	AR 40–2140. Original to corps area surgeon for transmission to The Surgeon General; one copy retained.
Report of veterinarian, purchasing.	Letter	AR 40–2045. Original to The Surgeon General through military channels; one copy retained.

e. Occasionally.

Title	W. D., M. D. Form No.	Reference and remark
Veterinary health certificate.	101	AR 40–2270. Prepared by the veterinarian of the issuing station. Original and copy to the receiving veterinarian; one copy to shipping officer; one copy retained.
Veterinary health certificate (memorandum section).	101	AR 40–2270. Memorandum section completed by receiving veterinarian. Original completed and forwarded to The Surgeon General through military channels. One completed copy retained.
Veterinary sanitary report of animal transport.	103a	AR 40–2055. Prepared by port veterinarian. Original to The Surgeon General through military channels; copy retained.
Trip report, veterinary transport service.	113	AR 40–2060. Prepared by transport veterinarian. Original forwarded to officer in charge; copy retained.
Special report of transport veterinarian.	Letter	AR 40–2060. Original to port veterinarian; copy retained.
Report of personnel accompanying shipment of animals.	Letter	AR 40–2035. Original to The Surgeon General through military channels; copy retained.

Title	W. D., M. D. Form No.	Reference and remark
Report of appearance of first case of serious communicable disease.	Letter	AR 40-2090. One to corps area surgeon; one to The Surgeon General (from units within continental United States); one to issuing veterinarian (if among animals received from another station); one to receiving veterinarian (if contact animals have been shipped); one to commanding officer; one retained.
Notification of communicable disease to civilian authorities.	Letter or such form as desired by civil authorities.	AR 40-2090. Original to civil authorities; copy retained.
Special professional reports epizootic diseases and other interesting cases.	Letter	AR 40-2090. Original to The Surgeon General through medical channels; copy retained.
Certificate of examination of officer's mount.	Letter	AR 40-2075. Original to officer requesting examination; copy retained.
Veterinary opinion on hospital buildings.	Letter	AR 40-2065. One to the commanding officer; one to The Surgeon General through military channels; copy retained.
Request for alteration or addition to hospital.	Letter	AR 40-2065. Original to The Surgeon General through military channels; copy retained.
Chart of tuberculin test	Letter	AR 40-2230. Original attached to report of meat and dairy hygiene (W. D., M. D. Form No. 110) and forwarded; copy retained.
Autopsy protocols	Letter	AR 40-410. Original to curator, Army Medical Museum through medical channels; one copy retained.
Clinical record	55-series	Paragraph 8, AR 40-2235, and paragraph 26, AR 40-2065. Filed in hospital office.
Receipt for animals	116	Paragraph 34, AR 40-2065. Original furnished organization presenting patient; duplicate filed.

Title	W. D., M. D. Form No.	Reference and remark
Emergency veterinary tag.	115b	Paragraph 39, AR 40-2245. For use in the field; original attached to patient; upon final disposition in theater of operations, duplicate will be completed and signed by responsible officer and forwarded with next report on W. D., M. D. Form No. 102; triplicate retained.
Index card register of animal patients.	115a	Paragraph 5, AR 40-2245. Filed at station.

339. Responsibility for veterinary reports and returns.—*a.* The senior veterinary officer of a station or other command is responsible for the preparation, authentication, transmission, and safekeeping of the reports, returns, and records prescribed for the use of the veterinary service (AR 40-2235).

b. In the absence of a veterinary officer, the surgeon will take charge of veterinary property and will render all reports pertaining to the veterinary service unless otherwise specifically excepted.

c. An attending veterinarian or a civilian veterinarian rendering professional service to a command will, in the absence of a veterinary officer, sign or initial (if name is typed) register and report cards of sick and wounded animals.

340. Disposition of records and reports on abandonment of station.—*a.* When a post is abandoned or a detachment is broken up the veterinary officer will report the fact through the commanding officer to the corps area surgeon and after completing all current reports will forward them, through channels with a letter of transmittal, to The Surgeon General (AR 40-2235).

b. In case all commissioned personnel, Veterinary Corps, are relieved or go on leave from a station or command at which a surgeon remains, the latter will take charge of all veterinary records. If all medical department personnel is relieved, the veterinary records will be disposed of as prescribed in *a* above.

341. Disposition of old records.—Registers of sick and wounded animals and the veterinary history of a station will be permanently preserved at such station. Other records and retained copies of

reports and returns will, in the absence of specific regulations and orders governing their disposition, be salvaged after 8 years from their date (AR 40-2235).

342. Mobile units temporarily at stations.—For purposes of administration, mobile units arriving at a station for maneuvers, summer training, etc., automatically become a part of such station, and all reports and returns will be consolidated and forwarded as a station record by the senior veterinarian on duty at the station (AR 40-2235).

343. Special reports and articles for publication.—*a.* When a medical or surgical case presents unusual or interesting features, a special report of the same will be forwarded by the veterinarian, through channels, to The Surgeon General.

b. Veterinary officers will not publish professional papers requiring reference to official records or to experience gained in the discharge of their official duties without the previous authority of the Secretary of War (AR 40-2235).

344. Correspondence records.—*a.* The War Department decimal system will be used for recording and filing the correspondence of veterinary general hospitals, convalescent hospitals, and such other offices as may be especially authorized (AR 40-2235).

b. The correspondence book system as prescribed by the War Department will be used for recording and filing the correspondence of all veterinary station hospitals and other veterinary formations except those for which some other system is specially prescribed.

c. The correspondence of veterinary officers on duty at the headquarters of a corps area will be considered a part of the correspondence of the office of the surgeon.

d. Correspondence books are furnished by The Adjutant General's Department and materials for the decimal system are furnished by the Quartermaster Corps.

345. Veterinary history of station.—A veterinary history of every permanent station will be kept by the veterinarian in a loose leaf binder. A copy of the veterinary sanitary report (AR 40-2255), the meat and dairy hygiene report (AR 40-2260), the forage inspection report (AR 40-2085), and the veterinary report of sick and wounded animals (AR 40-2245) will be filed therein in a single chronological sequence. Additional sheets measuring about 13 by 8 inches for noting the occurrence of epizootic diseases and other data of general and veterinary interest will be inserted as occasion requires at their proper chronological places. The prescribed record of the official endorsements on sanitary reports and W. D., M. D. Form No. 110 (Report of

Veterinary Meat and Dairy Hygiene and Forage Inspection) will invariably be made on the copy filed in the veterinary history (AR 40-2235).

346. Clinical record.—*a.* A clinical record will be kept for every patient in a veterinary hospital establishment. W. D., M. D. Form No. 55aV (Clinical Record Brief, Veterinary) and W. D., M. D. Form No. 55j (Clinical Record, Treatment) will be used in every case; the other lettered blanks of W. D., M. D. Form No. 55 will be used as the nature or importance of the case may warrant (AR 40-2235).

b. Upon transfer of a patient from one ward of the hospital to another or to a new station, the clinical record will be sent with him. The fact of transfer will be noted on W. D., M. D. Form No. 55g (Clinical Record, Progress).

c. Upon the completion of the case, all the sheets of the clinical record will be arranged in their proper order, fastened together at the top, all entries completed, and the record signed by the ward veterinarian. The record as completed and signed will be sent to the hospital office with the next morning report of the ward and will be filed according to the register number thereon.

347. Report of veterinary personnel.—A monthly report of veterinary personnel will be rendered on W. D., M. D. Form No. 86c (Statistical Report, Third Section—Personnel and Transportation), in accordance with section IV, AR 40-2245 (AR 40-2235).

CHAPTER 7

MEDICAL SIDE OF CHEMICAL WARFARE

SECTION I

CHEMICAL AGENTS

348. Use in war.—The United States is a party to the Geneva Gas Protocol of 1925. The terms of this international agreement forbid the use of poisonous gases in warfare. However, in the event of war with a country not party to the Geneva Gas Protocol or which disregards that agreement, it is necessary for all soldiers, but more particularly medical soldiers, to understand certain fundamentals. These fundamentals pertain partly to the soldier's self-protection and partly to knowing how to care for a patient who has been injured or disabled by one or more chemical agents.

349. Definition.—A chemical agent is a substance which, by its ordinary chemical action, produces—

a. A toxic effect on the body.

b. An irritant effect on the body.

c. A screening smoke.

d. An incendiary action (fire).

350. Kinds.—The following types of chemical agents may be used in warfare. Each group includes several substances of widely different chemical composition, but which act on the human body in the same general manner, and are therefore placed in the same group.

a. Tear gas.

b. Nose irritant gases.

c. Lung irritant gases.

d. Blister gases.

e. Gases which paralyze.

f. Incendiary agents (those which set fire to flammable objects).

351. Physical state.—A chemical agent is not always a gas. The term "gas" is used because it is convenient and has become sanctioned by long use. Some chemical agents are gases, some are liquids, and some are solids.

352. Concentration.—The amount of chemical agent in air (that is, the concentration) influences the effect produced by an exposure to such agent. The higher the concentration, the greater is the effect upon exposure to any chemical agent for any period of time.

353. Recognition in field.—Chemical agents in the field may be recognized by their odor and other immediate effects on the body. See table II, page 439. See section II for description of effects of chemical agents.

354. Basic rules for identification by odor:

a. No. 1.—Do not inhale deeply. Sniff.

b. No. 2.—Sniff only once. Repeated sniffing dulls the sense of smell.

c. No. 3.—First sniff, then think. The memory of odors can be trained by practice.

d. No. 4.—Every perception of odor must be named. Learn odors by memory of the thing sniffed, rather than by the name of something else. A thing is odorless only when no perception of odor is obtained.

e. No. 5.—After each test, breathe out strongly through the nose several times. Do not sniff a new sample until the old perception has vanished.

f. No. 6.—Do not smoke while sniffing. Smoking dulls the sense of smell.

355. Importance of ability to recognize.—Every soldier should, for his own protection, be able to recognize the odors of chemical agents. The medical soldier, in addition, must recognize them so that he may the better protect a disabled or other wounded man in his care.

356. Distinguishing between mustard and lewisite.—The two chief blister gases are mustard and lewisite. Both of them possess the general characteristics of the group as a whole, but differ in the following important details:

Mustard	Lewisite
1. Entirely insidious; presence hard to detect.	Presence easily detected.
2. Has a feeble and not very definite smell.	Has a strong and definite smell of geraniums.
3. Produces no immediately detectable effect on the body (unless a drop gets into the eye, when a mild irritation may be felt).	The vapor, if breathed for a few minutes produces a severe sensation of burning and irritation of the nose; the liquid produces a sharp tingling in contact with the skin, and immediately severe pain if a drop falls into the eye.
4. Cold or warm water has practically no effect except after long periods of time, such as days or weeks, but boiling water destroys fairly rapidly.	Contact with water at any temperature rapidly destroys.
5. Immediate application of the paste made of bleaching powder and water is effective in preventing burns. Bleach ointment is also effective.	Immediate application of the paste made of bleaching powder and water is effective in preventing skin burns, but bleach ointment is not effective.
6. Extremely persistent	Not so persistent, largely because of the action of water.
7. Effects are local and no general poisoning is caused.	When the skin has been heavily contaminated, symptoms of arsenical poisoning may accompany those caused by the burning.
8. Blisters should not be broken	Blisters should be opened because they contain arsenic.

Section II

INDIVIDUAL PROTECTION

357. Gas mask.—The Army gas mask is the best individual protection against chemical agents and is entirely satisfactory for this purpose. *The Army service gas mask will not protect* against carbon monoxide or ammonia gas and is not suitable for use in fighting fires or in industrial accidents where ammonia fumes are present. It is important to learn by practice how to put on and take off the mask quickly.

358. Solutions.—In the absence of a gas mask breathe through a handkerchief saturated with a solution of cooking soda (sodium bicarbonate) or soap suds. Use urine to wet the cloth if no soda or soap suds are available. Tear off a piece of shirt for this use if no handkerchief is at hand.

359. Other articles.—Obviously the gas mask cannot protect the individual's body against chemical agents. Since gas passes through the ordinary uniform, only a complete gasproof suit can protect the whole body. It is ordinarily impracticable to use such suits. Protection, therefore, depends on destroying chemical agents, protective covers for material, use of gasproof shelters, etc.

360. Tear gas.—Tear gas, or lachrymator gas, may be any one or more of chemical compounds which act upon the eyes. They produce acute pain, profuse outpouring of tears, and spasm of the eyelids.

a. Effect on eyes.—Tear gases do not usually do permanent damage to the eyes, for the effect is generally of comparatively short duration. But they cause an almost complete inability to see for the time being.

b. Effect on sympathetic nerves.—Tear gases sometimes cause vomiting.

c. First-aid treatment.—Since the damage is usually only of short duration, first-aid treatment is not so necessary as in other chemical injuries. The eyes should be protected from the gas and when the gas is no longer present, the eyes should be exposed to fresh air. The patient should be warned not to rub his eyes, as this increases the irritation. The eyes should be bathed with warm water, normal saline solution (1 teaspoonful of salt dissolved in a pint of water), or a weak solution of bicarbonate of soda (cooking soda). It is not necessary to evacuate patients whose only injury is from tear gas.

d. Mental effects.—Tear gas, like all other warfare chemicals, has another effect on human beings. It produces fear if its actual nature is not understood.

361. Nose irritants.—Nose irritants (sternutators) cause irritation of the nose and throat and a watery discharge from the nose. There is also coughing, pain at the base of the nose, severe headache,

and nausea. Mental depression is a characteristic effect of this group of chemicals.

a. Damage.—Usually little or no permanent damage is caused, though there is at the time very real distress. The effect of nose irritants may be either immediate or delayed for as much as 30 minutes or longer.

b. First-aid treatment.—The patient should be put at rest and his clothing loosened. The nose and throat should be bathed with warm, weak solutions of sodium bicarbonate (cooking soda), 10 grains to 1 pint of water. Keep the patient away from heat. If vomiting has resulted from this gas, copious drafts of the weak sodium bicarbonate solution will help to relieve him. It is usually not necessary to evacuate patients whose only injury is from a nose irritant gas. However, the more serious cases of this kind may have to be evacuated.

c. Mental effects.—Besides the mental depression caused by nose irritant gases, the effect on morale must be considered. If the patient does not understand that his condition is not serious his fear may be very great. Medical soldiers should understand the condition and therefore be able to reassure patients.

362. Lung irritants.—Lung irritant gases are very dangerous chemical agents which may cause death if the patient is exposed to them for a long period. However, slight or brief exposures are not likely to cause such serious results. Lung irritants affect the patient's ability to breathe.

a. Symptoms produced.—These vary considerably with the particular gas encountered and with its concentration. They are usually irritation of the nose and throat with coughing, difficulty in breathing, pains in the chest, vomiting, and a blue pallor of the lips and ear lobes. The face takes on a grayish pallor.

b. Appearance of symptoms.—The symptoms of damage to the lung do not as a rule come at once. Usually about 2 hours elapse before such symptoms appear. There is sometimes what is called "delayed action"—that is, the effect of the gas seems to be absent at first, only appearing after some time has elapsed. It is important to remember that even though the symptoms seem slight, more serious effects may come on later.

c. Treatment of casualties.—Patients suspected of being injured by lung irritant gases should not be allowed to walk. All casualties known or even suspected to have been seriously exposed to one of these gases should be treated as litter cases from the start.

d. First-aid treatment.—Remove the patient from the gas atmosphere if possible. The gas mask must not be removed until the patient has been removed to a place where the air is free from gas. Loosen the clothing and keep the patient at absolute rest. Do not allow him to walk. Keep him warm with blankets, hot water bottles, etc. Give such nonalcoholic stimulants as hot coffee or tea. The administration of oxygen is required in extreme cases. Such patients should be evacuated to aid stations as soon as possible.

e. Danger period.—The most dangerous period for the patient who has been exposed to lung irritant gas is the first 48 hours. Most deaths occur within this time. Therefore, exercise great care when patients are first seen.

f. Precaution against artificial respiration.—Artificial respiration is not to be performed on lung irritant gas casualties. The lungs are seriously damaged and likely in a waterlogged condition. Artificial respiration would probably do more harm than good and might even cause sudden death.

363. Blister gases.—This group of gases produces special and peculiar characteristics which are so important individually and which cause so many different problems that their five principal effects are considered separately below:

a. Persistence and power.—(1) *Persistence.*—Members of this group are normally liquids of a somewhat oily consistency. Under normal weather conditions in temperate climates they persist up to 3 weeks if the original contamination was heavy and if the area affected is sheltered from direct action of wind and sunlight.

(2) *Power.*—The power of these chemicals is so great that a drop the size of the head of a small pin can produce a blister the size of a quarter. The exposure to a vapor of one part per million parts of air for an hour is capable of producing a casualty. The action on the eyes is particularly marked.

b. Penetration of materials and of the human body.—The ability of blister gases to penetrate is one of their characteristics. They "soak in" just as ink soaks into a blotter. This is not the same as "eating in" as when an acid acts on a metal. In other words the "soaking in" takes place without any damage to the material (clothing, etc.). These chemicals also "soak into" the body. About the only substances which withstand this power of penetration are metal, glass, and highly glazed resistant materials such as tiles or porcelain.

c. Insidious character.—By this is meant that the presence of such a gas (for example, mustard gas) may not be very obvious, either by smell or by producing any particular sensation such as burning. On

the other hand, lewisite, another of the chemicals of this group, has a characteristic smell (like geraniums).

d. Delayed action.—One of the important peculiarities of this group, and one which makes them very dangerous, is that while the actual damage takes place rapidly the recognizable signs of such damage do not appear for a considerable time. Thus a patient may be contaminated without knowing it (insidious character) and yet may show no signs of damage for 24 hours. However, the average time of the development of clinical signs or symptoms is about 4 to 8 hours for mustard gas, and even sooner for lewisite.

e. Universal action.—Unlike the agents of the other groups, the effects of this group are not confined to any one area of the body. The blister gases have the power to burn and blister *any area* with which they come in contact, either as a liquid or as a vapor. This is equally true of areas *within the body.*

364. Effects of blister gases.—The damage caused by this group of chemicals varies somewhat with the area affected. The various parts of the body affected by the blister gases are considered below:

a. Eyes.—The eyes are very liable to injury, whether from liquid or vapor. Though there may be some delay in appearance of signs, such delay is less than in other areas of the body. A few hours after exposure, inflammation (conjunctivitis) sets in, with smarting, watering, and finally closure from swelling of the eyelids. Conditions rapidly get worse and there is much pain, especially on exposure to light (photophobia), with discharge coming from between the swollen lids. Actual destruction of the eye and consequent blindness is rare, but there may be some impairment of vision due to scars.

b. Respiratory system.—Inflammation of the throat and windpipe (trachea) as a result of breathing air contaminated by the vapor of these liquids is fairly common. It produces dry and burning mouth and throat, with harsh, ringing cough. This cough is very characteristic and very distressing. Partial loss of the voice due to inflammation of the throat (laryngitis) is common. In most severe cases burning of the lungs may produce pneumonia.

c. Digestive system.—Inflammation of the stomach, with pain and vomiting may occur. This is the result of swallowing contaminated saliva, or the swallowing of contaminated food or drink. It is not serious as a rule.

d. Skin.—Injury to the skin develops in three stages: Reddening (erythema) with a fine rash not unlike "hives", blistering, and finally ulceration. How far the casualty progresses toward the final stage depends on the original concentration of the chemical agent and the

length of the patient's exposure to the poison. In case of contamination by liquid, blistering always occurs if steps are not taken at once to counteract the effects. The areas of skin most likely to suffer from exposures to vapor are those which are normally moist, such as the bend of the elbows and knees, the armpit (axilla), the crotch, and the inner side of the thighs. The genitals are particularly liable to attack.

365. Death rate from blister gases.—It is encouraging to remember that while the number of casualties due to these agents is high, chiefly due to their persistence and insidiousness, the death rate is *low*. It was only about 2 percent in the World War.

366. First-aid treatment of patients injured by blister gases.—It must be remembered that *preventive treatment* is very important. First-aid must take into consideration the "insidiousness" and the "delayed action" of this group.

a. Eyes.—The only first-aid for blister gas in the eyes is free washing either with plain, warm water, normal saline solution (1 teaspoonful of salt in a pint of water), or sodium bicarbonate (cooking soda) solution of about 10 grains to a pint of water. This washing should be carried out as soon as possible after exposure. The solution should be run directly to the eyes by means of a rubber tube from an enema can or similar container. A little vaseline on the edges of the eyelids will prevent their sticking together.

b. Breathing passages.—Cases in which signs of damage to the breathing passages have developed, including the mouth and throat, have evidently been exposed to relatively high concentrations of vapor for a considerable period of time. Such cases are likely to be serious. Most of the deaths caused by blister gases are due to this. The hard, dry, "brassy" cough is very characteristic of this condition. One of the earlier symptoms is loss of voice from inflammation of the throat (laryngitis). First-aid cannot cope with this condition. The patient must be hospitalized as soon as possible.

c. Digestive system.—The pain in the stomach and vomiting can be temporarily relieved by draughts of warm sodium bicarbonate (cooking soda), 10 grains to 1 pint of water. Such cases should be hospitalized as soon as possible.

d. Skin.—It is important to remember that there is a delay of some hours between the time that the chemical agent comes into actual contact with the individual and the time at which he develops recognizable signs or symptoms of damage. Yet, as a matter of fact, the damage has already begun almost immediately, and the delay is only in the development or the signs that we recognize.

There are two measures which may be taken in first-aid treatment. The chemical agent may be removed by washing or wiping, and it may be neutralized. If the actual liquid has reached the skin, treatment must be begun in less than 5 minutes to be satisfactory. If only the vapor has reached the individual, the time is longer. The only efficient agent to neutralize blister gases is chloride of lime (bleaching powder). This neutralizing agent is itself irritating and must be removed by subsequent washing. If bleaching powder is not available, immediate soap and water baths may remove some of the poisonous agent. If the liquid chemical agent, such as mustard, has reached the skin, much of it may be removed by wiping with a clean cloth moistened with kerosene (coal oil) or straight gasoline (but not gasoline containing lead). When bleaching powder is used, the most effective method of its application is to make a paste of a small quantity of the bleaching powder with water, the mixture being carefully stirred while being prepared. Usually equal volumes of water and of bleaching powder are used. The contaminated area of skin is covered as well as the immediately surrounding area. The paste is rubbed in well for about 1 minute and then removed by wiping with a dry rag or by flushing off with a large quantity of water, if available. A subsequent bath with soap and water is desirable. Care must be taken not to get the bleaching powder paste into the eyes. If the skin has already begun to show definite redness or blisters, the bleaching powder should not be used, as it is irritating.

367. Paralyzing gases.—*a. General.*—Gases which cause paralysis have been used in warfare, but without much success. There are three gases which may be used for their paralyzing effect:

(1) Hydrocyanic (prussic) acid.
(2) Sulfureted hydrogen (hydrogen sulfide).
(3) Carbon monoxide (called fire damp by miners).

Such gases are very dangerous and some of them may result from the explosion of projectiles. Hydrocyanic acid has the faint odor of bitter almonds (peach kernels). Hydrogen sulfide has definitely the smell of rotten eggs. Carbon monoxide has no odor. It is the gas that results from incomplete combustion, such as from charcoal flames or automobile exhausts.

b. Symptoms.—These begin with uneasiness, dizziness, and rapid heart beat and breathing. Unconsciousness and convulsions follow rapidly, and death occurs through paralysis of the part of the nervous system which controls the breathing (respiratory center).

c. First-aid treatment.—Treatment must be immediate. Prompt removal from the poisonous atmosphere, artificial respiration, and ad-

ministration of oxygen. A valuable addition to the oxygen is 5 to 7 percent of carbon dioxide. This last stimulates and increases respiration and helps flood the lungs with oxygen and wash out the poison in the blood. The patient must be kept warm.

368. Incendiary agents.—*a. General.*—Incendiary agents are chemical agents which cause fires. The more common forms are white phosphorus and thermite.

b. First-aid treatment.—The treatment is essentially that of ordinary burns. Particles of white phosphorus may be adhering to the skin and hence have to be picked off. The chief use of white phosphorus in warfare is as a smoke-producing material.

Section III

COLLECTIVE PROTECTION

369. Small areas.—It is possible to remove contaminating chemical agents from the areas involved, provided the area is not too extensive. Extensive areas cannot be decontaminated because such a large amount of the neutralizing agent is required. Chloride of lime (bleaching powder), standard article of issue for this purpose, can be used under field conditions to neutralize a small mustardized area.

370. Large areas.—When large areas in the field cannot be decontaminated such areas are evacuated if possible. Warning signs should be posted on all avenues of approach. Remember that high vapor concentrations will be found in the areas immediately downwind from mustardized areas. They should be treated the same way as the mustardized areas themselves.

371. Food.—*a. Protection.*—All food supplies at the front should be kept in airtight containers until required for use. Ration carts and kitchens should be covered by paulins for protection against chemical spray.

b. Contaminated foods.—Food having a peculiar odor or taste, and suspected or known to have been exposed to a chemical agent should be discarded.

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c. Susceptibility to contamination.—Some foodstuffs absorb chemical vapors more quickly than others. Fatty and oily substances, such as meat and butter, and meal and flour, are quickly contaminated by vapors. Green vegetables are less readily affected by vapors.

372. Water.—Water contaminated by mustard gas should be avoided. If necessary, however, such water may be rendered safe for use by settling or chlorination. When such water stands, the liquid mustard sinks to the bottom. Allow the water to settle for not less than 4 hours. Siphon off the top portion, leaving a layer 10 or 12 inches in a container of the dimensions of a barrel. This lower layer should be thrown away. Chloride of lime (bleaching powder) in the proportion of one-fifth of a pound to the gallon of water, should then be added and the water should be boiled for at least 1 hour. Contaminated water in shell holes should be avoided. Water contaminated by lewisite, irritant smokes, or white phosphorus cannot be purified by this method.

373. Clothing.—*a. Removal.*—Only rarely does the actual liquid chemical agent pass through the clothing. That only takes place when the clothing is soaked with it. On the other hand the vapor readily passes through clothing. Therefore, remove all of the patient's clothing and treat his whole body by washing with soap and water. Remember that the clothing after removal from the patient's body is still contaminated. Men have been seriously burned by picking up contaminated clothing.

b. Decontamination.—Contaminated clothing should be collected into receptacles, preferably metal ones with close-fitting lids (such as G. I. cans). These cans should be turned over to the details whose duty it is to do this work. Men of the Chemical Warfare Service when available are assigned these duties.

374. Precautions against enemy's chemical agents.—*a. In the field.*—All chemical agents are heavier than air and settle in shell holes, depressions in the earth, dugouts, trenches, etc. Therefore, seek high ground and open spaces which are free from gases insofar as the military situation permits.

b. Precautions in presence of gas cloud.—Move out of the gas cloud as quickly as possible. Proceed cross-wind, if possible. If a gas cloud envelops a building, close all doors and windows tightly, put out all fires, plug all chimneys, and go to the upper floors of the building.

c. Procedure during gas attack.—As soon as it has been established that a gas attack is in progress, the alarm should be given by all

means available. Masks are adjusted, doors of gasproof shelters are lowered, fires are put out in such shelters, matériel is protected, and, in general, all routine measures of individual and collective protection are carried out. Casualties are removed from the gassed area as soon as possible and first-aid treatment given.

375. Evacuation of gas casualties.—In the evacuation of a patient who has been injured by chemical agents, the following measures should be employed:

a. At aid stations.—Examine gas mask and if gas is still present in the surrounding air, leave it on the patient. Remove the equipment and loosen the clothing. Remove the clothing if it is contaminated with blister gas (mustard or lewisite) and wrap the patient in a clean blanket. If affected by mustard gas, wash the patient's eyes with 2 percent sodium bicarbonate (cooking soda) solution. Apply dressings to wounds caused by other war weapons. See that the patient avoids unnecessary movement if suffering from a lung irritant. Keep him quiet. Produce vomiting by giving the patient tepid salt water, if safe to remove the mask. Inspect the emergency medical tag and make the proper notation thereon. Expedite evacuation to the collecting station.

b. At collecting stations.—Change the patient's clothing and thoroughly bathe all individuals who have been affected by blister gases. Completely demustardize all clothing and matériel where time and facilities permit. Adjust dressings. Give special treatment as indicated, including administration of oxygen if available in cases of lung damage. Prepare the patient for evacuation.

c. At special degassing stations.—Administer neutralizing chemicals and degas clothing by the group method.

d. At clearing stations.—Sort and classify the patients, separating them according to the nature of the chemical agent that injured them. Bathe. Retain critical cases for observation. Demustardize if this has not been previously and thoroughly done. Administer oxygen if available when indicated. When patient is fit for transportation, evacuate to the rear.

Section IV

MEDICAL CARE OF CHEMICAL CASUALTIES

376. Cases requiring hospital care.—Any patient suffering from disability due to the action of a chemical agent should be treated in hospital whenever and as soon as possible. This is particularly true if the patient is also suffering from a wound.

377. General nursing care.—Patients suffering from injury from chemical agents are usually both physically and mentally depressed. They must be handled with both gentleness and firmness. All ordinary nursing cares must be intensified. All precautions must be taken to prevent infection and pressure sores (bed sores, etc.). The eyes must receive earliest possible attention. Pure air and rest are essentials. All strain on the heart and lungs must be avoided or relieved. In general, the treatment must be carried out in accordance with the patient's condition. It is impossible to give specific directions covering all cases. Common sense is needed.

378. Treatment of shock.—As all patients of this kind are suffering from some degree of shock, the first essentials are warmth, complete rest, and fresh air. They should be reassured as soon as possible that their troubles, however trying, are temporary; above all, they must be encouraged to be hopeful.

379. Clothing.—Both the clothing worn by the patient and the bed clothing should be light, loose, and warm. Pillows should be arranged according to the degree of shock and the comfort of the patient.

380. Position of patient.—See paragraph 379. In order to allow the escape of fluid from the mouth, the patient's head and shoulders should be supported and turned to one side. There should be hot-water bottles, back rests, rubber sheeting, etc., according to the needs of the individual.

381. Observation.—Each case requires constant observation because of the necessity of reporting immediately any alarming or new symptoms.

382. Diet.—The diet should be liquid, warm, and nourishing. If the patient vomits, there should be copious draughts of warm water and sodium bicarbonate (cooking soda) (a level teaspoonful to 1 pint of water). Thirst is not an outstanding feature. Patients must therefore be encouraged to take sufficient fluid.

383. Nursing of cases.—*a. Tear gas.*—These cases are unlikely to be admitted to hospital, and even if admitted the effects of the tear gas are so transient that usually no nursing problem arises. The patient can usually bathe his own eyes with plain warm water. Where time permits, a drop of olive oil, mineral oil, or castor oil may be dropped into the eyes.

b. Nose irritant.—(1) Such cases are usually so slightly severe that they do not reach the hospital. However, if the exposure to the gas has been abnormally long or severe, there may be such complications as mental depression, occasionally leading to suicidal tendencies.

(2) The initial coughing and sneezing may be followed by dizziness, occasionally merging into unconsciousness. Patients are often mentally dulled, indifferent, and disinclined to exert themselves.

(3) A possible early complication is a temporary paralysis of the limbs. This soon passes off. The weight of the bed clothes should be supported by bed cradles.

(4) Later, sometimes after about 4 days, there may be numbness or shooting pains in the arms and legs. Such symptoms may cause alarm because one may think that they arise from injuries other than poisoning by nose irritants.

(5) In addition to ordinary nursing care, some patients are relieved by nasal douching with a weak solution of sodium bicarbonate (cooking soda), a level teaspoonful to a pint of water. The same solution may be used as a gargle or may be administered internally.

(6) Symptoms of arsenic poisoning may be suspected. They include restlessness, irritation of the skin or mucous membrane, pain in the throat and abdomen, nausea, etc.

c. Lung irritant.—(1) All such cases must be admitted as litter cases, and require complete rest, with sparing of all exertion, extreme gentleness in handling, and constant attention. The condition of the patient on admission depends on the degree of lung damage already developed. This damage, as it develops, causes difficulty in breathing and heart strain.

(2) The clinical picture depends upon the degree of the edema of the lungs that has been produced. In an advanced case the face and neck are flushed and blue (cyanosed) and the respiration appears forced and difficult. Patients with such symptoms are sometimes called the

"blue type." Unless this condition is checked, heart failure results. This is indicated by an increased pallor. This stage is sometimes described as the "grey type."

(3) The administration of *oxygen* is always indicated.

(4) *Venesection* (blood letting) followed by intravenous administration of saline solution may be indicated.

(5) *Sedatives* may be ordered, but morphine is contra-indicated since it may tend to depress the respiratory center (the area of the brain that controls breathing).

(6) *Heart stimulants*, such as hypodermic injections of camphor or pituitrin, may be ordered.

(7) Raising the foot of the bed, a few minutes at a time, sometimes relieves the "waterlogging" of the lungs by assisting the patient to get rid of the exudate.

d. Blister gas.—(1) *First-aid measures.*—See paragraph 366.

(2) *Objects.*—The nursing of such cases has three main objects:

(*a*) The prevention of secondary infection.

(*b*) The healing of actual injury.

(*c*) Suggestion and tactful firmness to combat the patient's tendency to mental depression.

(3) *Delayed action.*—Remember that the effects of blister gases are delayed for periods varying from 2 to 48 hours.

(4) *Eyes.*—(*a*) The patient must be reassured that his sight will not be lost. Severe inflammation results from contamination, either by the vapor or the liquid chemical agent, the latter being more serious. The conjunctivae may be so swollen as to protrude between the swollen and edematous eyelids. The discharge soon becomes pussy.

(*b*) Treatment should be immediate. It consists of frequent and copious irrigation with a warm solution of sodium bicarbonate (cooking soda), a level teaspoonful to a pint of water. This is followed by the instillation of a few drops of olive oil, mineral oil, or castor oil. The eyes should *not* be bandaged, but an eyeshade may help. Drops of a 2 percent solution of argyrol or protargol may be ordered. Frequent bathing or hot applications *outside* the lids may help to relieve the pain.

(5) *Nose and throat.*—(*a*) Sneezing, coughing, and hoarseness may be eased by gargling and douching with any bland solution, spraying with any suitable antiseptic solution, or by inhaling steam from a pint of boiling water containing a teaspoonful of a mixture of menthol (10 grains) in compound tincture of benzoin (1 ounce). Patients should breathe through a perforated mask (pad of gauze

moistened with an antiseptic and pain-deadening mixture prescribed by a medical officer).

(*b*) Secondary bronchitis or broncho-pneumonia may occur in cases showing damage to the respiratory tract. Therefore, when practicable, treat such cases in a separate ward.

TABLE II.—*Identification of chemical agents*

Chemical agent	Symbol	Odor	Other immediate effect
Chlorine	CL	Disagreeable; pungent.	Choking; coughing; discomfort in chest; smarting of eyes.
Mustard gas	HS	Garlic; horseradish	None.
Ethyldichlorarsine	ED	Biting; irritating	Nasal irritation.
Phosgene	CG	Silage; fresh cut hay	Coughing; tightness in chest; eye irritation.
Chlorpicrin	PS	Sweetish; flypaper	Flow of tears; nose and throat irritation; vomiting.
Adamsite	DM	No pronounced odor	Headache; vomiting.
Diphenylchlorarsine	DA	No pronounced odor	Sneezing; vomiting; headache.
Chloracetophenone	CN	Locust or apple blossoms; ripe fruit.	Flow of tears; irritation of skin in hot weather.
CN solution	CNS	Sweetish; flypaper	Flow of tears; irritation of skin.
Brombenzylcyanide	CA	Sour fruit	Flow of tears; nasal irritation.
White phosphorus	WP	Matches	Glow from burning particles; incendiary effect.
HC mixture	HC	Acrid	Slight suffocating feeling.
Sulfur trioxide in chlorsulfonic acid.	FS	Acrid (strong)	Prickly sensation on skin; eye irritation.
Titanium tetrachloride.	FM	Acrid (mild)	Very slight irritation of eyes.

(6) *Skin.*—(*a*) Skin should be cleansed *gently* with soap and warm water, and the hair on the affected areas clipped. Erythema (redness) is frequently followed by blisters which may result in ulceration. Every effort must be made to prevent secondary infection of these raw surfaces.

(*b*) The itching of the early inflammation may be relieved by the application of calamine or other alkaline lotions, dusting powders, or ointments, as prescribed by a medical officer. Blisters must be

opened under antiseptic precautions, and the blister fluid carefully removed. Dressings of old sterile linen are better than those of gauze, since the latter tends to stick. The use of oiled silk or other material that retains discharges must be avoided. The resulting scars are weak and must be protected even after healing.

(7) *Lewisite injuries.*—Lewisite has greater rapidity of action than mustard. Penetration of the skin is much quicker, and irritation is intense. The serum from the blisters must be evacuated aseptically, the epithelium (top layer of the skin) removed, and the raw surfaces irrigated. This is done to lessen the absorption of arsenic compounds (lewisite contains arsenic). The patient's eyes must be irrigated and the same general measures taken as described above.

CHAPTER 8

VETERINARY FOOD INSPECTION

SECTION I

MEAT AND MEAT PRODUCTS

384. General.—The terms "meat" and "meat food products" as used in Army publications imply all foods of *animal origin*, and include such products as beef, pork, lamb, poultry, eggs, fish, milk, butter, cheese, and ice cream.

385. Purpose of inspection.—*a.* The primary purpose of all meat food inspection is to conserve human health. The animals from which meat is obtained are subject to many diseases which are directly transmissible to man (for example, tuberculosis, trichinosis, and undulant fever). During its preparation the meat may become contaminated and act as an indirect carrier of such diseases as typhoid fever or septic sore throat. Meats, being perishable, may deteriorate and form toxins which are harmful to health.

b. Adequate inspection insures that the meat comes from healthy animals; that it is prepared in a sanitary establishment and protected from contamination; that harmful ingredients are not added; that it is not misbranded; and that *at the time of delivery* (to the mess sergeant) it is sound, healthful, and fit for human consumption. These various inspection procedures are known as "sanitary inspections."

c. The secondary purpose of meat inspection (in the Army) is to insure that the *quality* of the product complies with the contract specifications. This is known as "inspection for quality."

386. Scope.—It is obvious that a given piece of meat will have had a number of sanitary inspections throughout the process of its manufacture, but only one inspection for quality is necessary and this is made at the time of acceptance from the contractor.

387. Inspection agencies.—*a.* Various health laws provide for the sanitary inspection of meat products. They may be Federal, State, or municipal. The Army unconditionally recognizes only the Federal inspection which is operated by the Department of Agriculture through its Bureau of Animal Industry. Other agencies may be recognized, but only after investigation by the Veterinary Corps as to their adequacy and competency.

b. A Federal law, Meat Inspection Act of 1906, requires that all meat produced from cattle, sheep, swine, or goats and which enters into interstate or foreign commerce must be inspected and passed by the Department of Agriculture. Such meat can be identified by the inspection legend which may be stamped with blue ink directly on the carcass of the animal or printed on the wrapper or embossed on the can of processed meats. Examples of this legend are shown in figure 110.

c. This legend insures that, at the time of leaving the establishment, the meat was sound and healthful. It has no reference to quality. And it will be found only on meats made from cattle, sheep, swine, or goats.

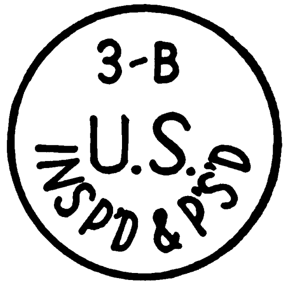
d. All meat products, as defined in paragraph 384, intended for Army use, are inspected both for quality and sanitation by the Veterinary Corps.

388. Fresh meats.—A large part of our meat requirements are used in the fresh state and preserved by refrigeration, either as chilled or frozen meat. Chilled meat is held at a temperature of 32° to 36° F., while frozen products are held at zero to −10°. Fresh meat includes—

a. Beef.—(1) Beef is the flesh of mature cattle, marketed in quarters (fore and hind) or in various wholesale cuts, such as loins, rounds, and ribs. Beef is classified, according to sex, as steer, heifer, cow, bull, and stag. The Army buys only steer beef. A steer is a bovine animal which has been castrated prior to sexual maturity. The grade of beef is determined by its conformation, finish, and quality.

(*a*) Conformation refers to the general form of the carcass.

(*b*) Finish is the amount, color, texture, and distribution of the fat.



Meat Stamp

U. S. INSPECTED
AND PASSED BY
DEPARTMENT OF
AGRICULTURE
ESTABLISHMENT
199

Legend Printed on Label

12 OZS. NET
BEEF, CORNED, CANNED
PACKED BY
[redacted]
U.S. INSPECTED & PASSED
ESTAB. [redacted]

Legend Embossed on Can

FIGURE 110.—Inspection legends.

(*c*) Quality is the color and texture of the lean meat, together with the presence or absence of fat in the muscle fibers, so-called "marbling."

(2) The following table shows some general differences between high grade and low grade beef:

	High grade	Low grade
Conformation	Full rounds	Flat rounds.
	Wide loins—short neck and shank.	Thin loins—long neck—tapered shanks.
Finish	Well covered with creamy white brittle fat.	Little or no cover of fat and yellowish in color.
Quality	Meat firm and dry	Soft, flabby, moist.
	Cut surface of flesh is bright red, velvety in texture.	Dark red, coarse fibers.
	Bones red and of soft texture.	Gray and flinty.

(3) Cuts and quarters of beef are delivered unwrapped in clean, closed, refrigerated trucks, or wrapped in stockinette and sewed in burlap. It should be stored under refrigeration at about 36° F., and at this temperature can be kept for a week to 10 days. Softness of flesh, slime, and a foul odor are indicative of spoilage.

(4) Figure 111 shows a side of beef, with its principal wholesale and retail cuts.

b. Pork.—(1) Pork is the flesh of a porcine animal slaughtered at maturity, but usually under 1 year of age. Pork produced from old sows and boars is not acceptable in the Army. The usual cuts of fresh pork are loins, shoulders, spareribs, and butts. A limited number of hams are also sold as fresh pork. Figure 112 shows a pork carcass together with these several wholesale cuts. In general, pork bellies are cured and marketed as bacon. Pork cuts are grouped and marketed according to their weight, allowing a 2-pound tolerance within groups, for example:

Loins	8 to 10 pounds.
	10 to 12 pounds.
	12 to 14 pounds, etc.
Hams	10 to 12 pounds.
	12 to 14 pounds.
	14 to 16 pounds, etc.

(2) Good quality pork is relatively firm and dry, grayish-pink in color, and free from objectionable odor. The skin should be clean, free from wrinkles, thin, and smooth in appearance.

(3) Fresh pork is highly perishable and should not be kept for more than 2 to 3 days.

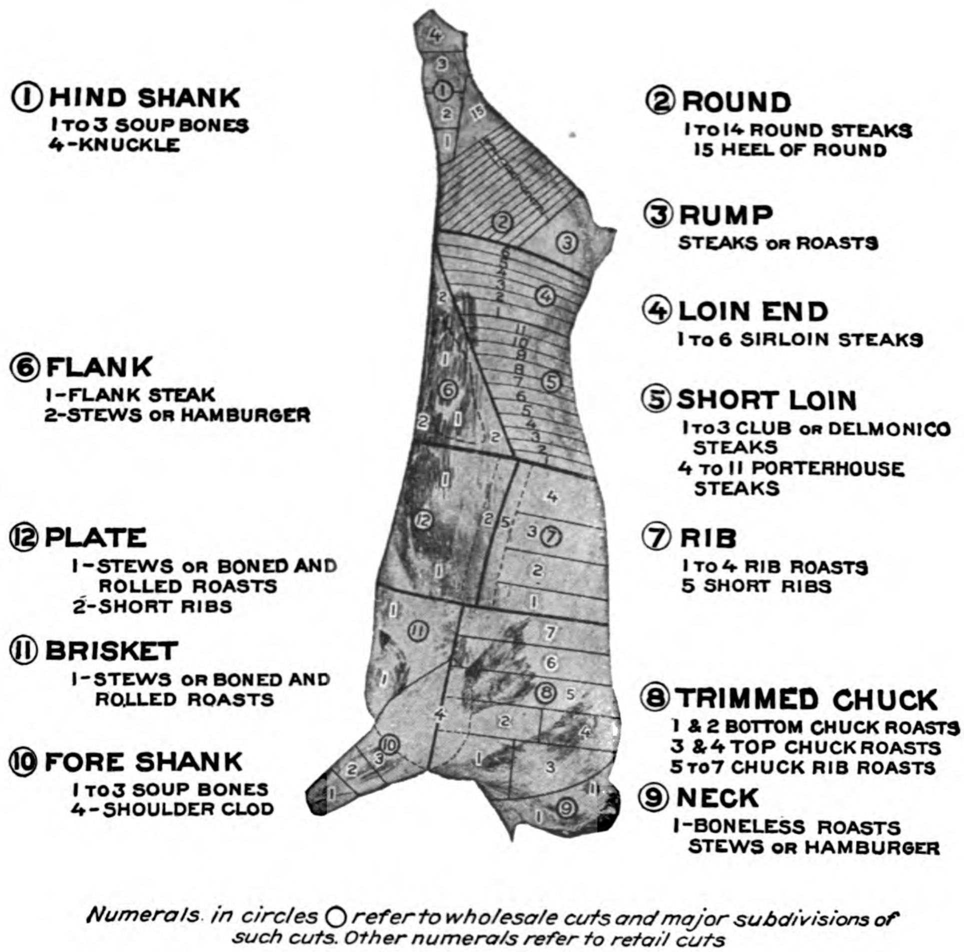
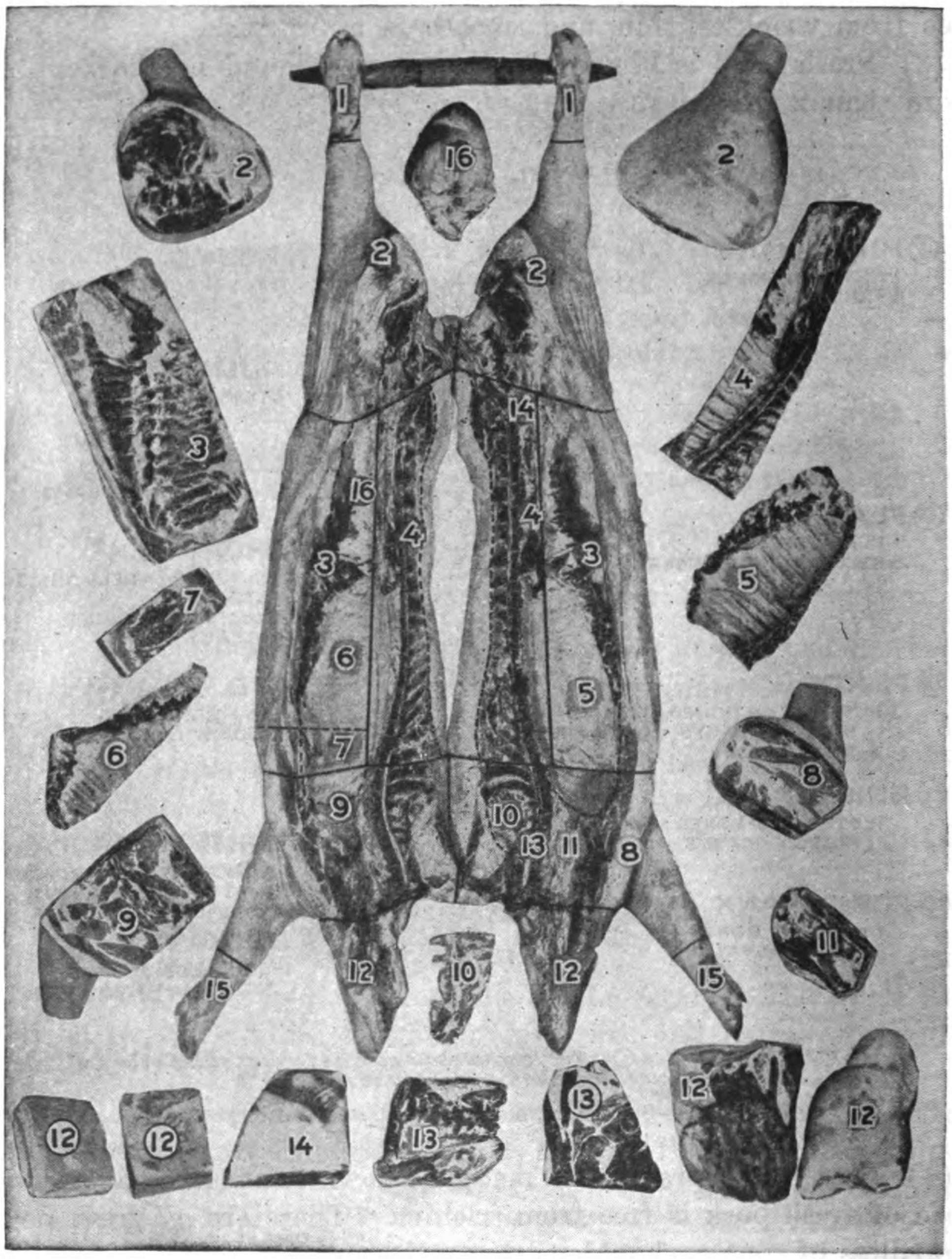


FIGURE 111.—Beef chart, showing wholesale and retail cuts.

(4) There is no practicable method known to insure that a given piece of fresh pork is free from trichina. Therefore *all* fresh pork, regardless of source, should be thoroughly cooked before eating.

c. Veal.—(1) Veal is the flesh of a young bovine animal which has subsisted largely on milk. There is no hard and fast rule as to the age animals intended for veal should be at the time of slaughter, but they are usually marketed when from 1 to 3 months old. Within this age range well nourished calves show a marked uniformity in the character and consistency of their flesh regardless of breed or



1. Hind feet.
2. Hams.
3. Clear bellies.
4. Pork loins.
5. Spare ribs (full sheet).
6. Spare ribs (half sheet).
7. Brisket.
8. Picnic.
9. New York style shoulder.
10. Neck bones.
11. Picnic butt.
12. Jowl butts (untrimmed).
12. Jowl butts (trimmed).
13. Boneless butt.
13. Boston butt.
14. Loin butt.
15. Forefeet.
16. Leaf fat.

FIGURE 112.—Wholesale pork cuts.

sex. A high grade veal carcass should be short and plump, with the back and ribs well covered with light pinkish-brown flesh, and a thin covering of fat over the back and upper part of the rounds. There should be an abundance of internal fat around the kidneys and in the crotch. The flesh should be firm, fine grained, and velvety.

(2) The Army purchases two classes of veal, so-called light weight (75 to 120 pounds per carcass), and heavy weight (121 to 190 pounds).

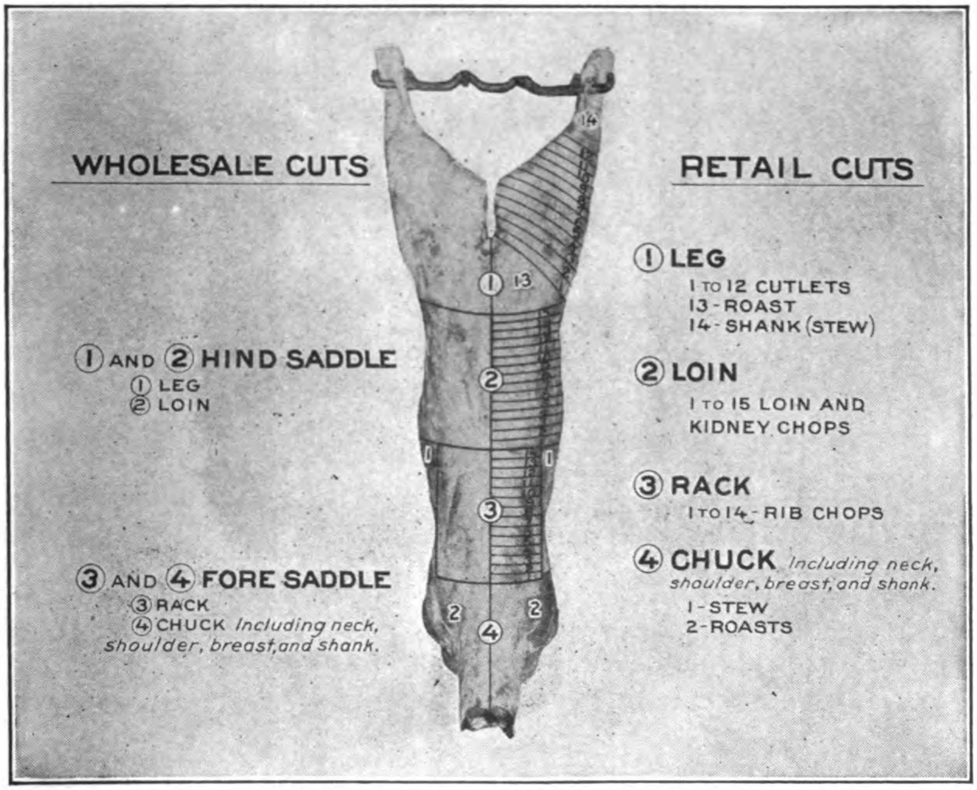


FIGURE 113.—Veal chart. Numerals in circles refer to wholesale cuts. Other numerals refer to retail cuts.

(3) Except in the heavier weights of veal, the carcass is not split into sides but sold either as an entire carcass or as legs, loin, rack, etc. See figure 113.

(4) Veal is quite perishable and also dries out rather quickly unless kept well wrapped.

d. Lamb.—(1) Lamb is the flesh of a young ovine animal slaughtered at from 3 months to about 1 year of age.

(2) A high grade lamb carcass should be plump with a broad back and a well fleshed loin. There should be an even finish of fat over the back and sides with a plentiful supply of internal fat over

the kidneys and in the crotch. The lean flesh should be firm, fine-grained, and of a light pink color. The bones are relatively small and soft and their split surfaces tinged with blood.

(3) Lamb is marketed as carcasses (30 to 50 pounds each) or as wholesale cuts. See figure 114.

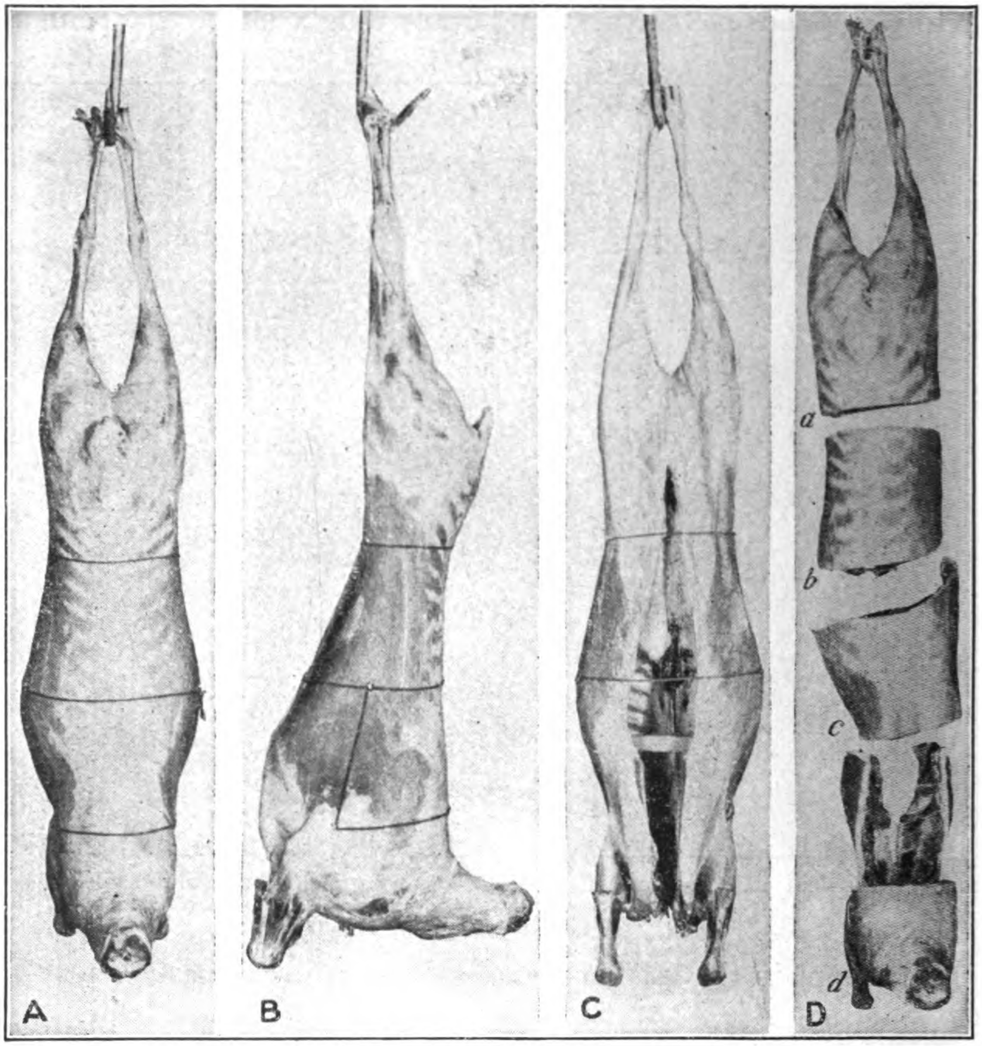


FIGURE 114.—Wholesale cuts of lamb. *A, B, C,* three views of carcass marked to show wholesale cuts; *D,* carcass after following cuts have been made: *a,* legs; *b,* loin and flank; *c,* hotel rack; *d,* chuck and breast, including neck.

(4) Lamb can be differentiated from mutton by the soft pinkish appearance of the split surface of its bones. The age is especially noticeable in the so-called "break-joint" of the front legs. In lambs the phalanges are removed by a fracture through the epiphyseal cartilage of the distal end of the metacarpal bone, leaving a broad,

dentated surface. In mutton it is impossible to remove the epiphysis, due to ossification of the cartilage. See figure 115.

e. Poultry.—Poultry refers to live or dressed fowl. Chicken and turkey are more commonly used by the Army.

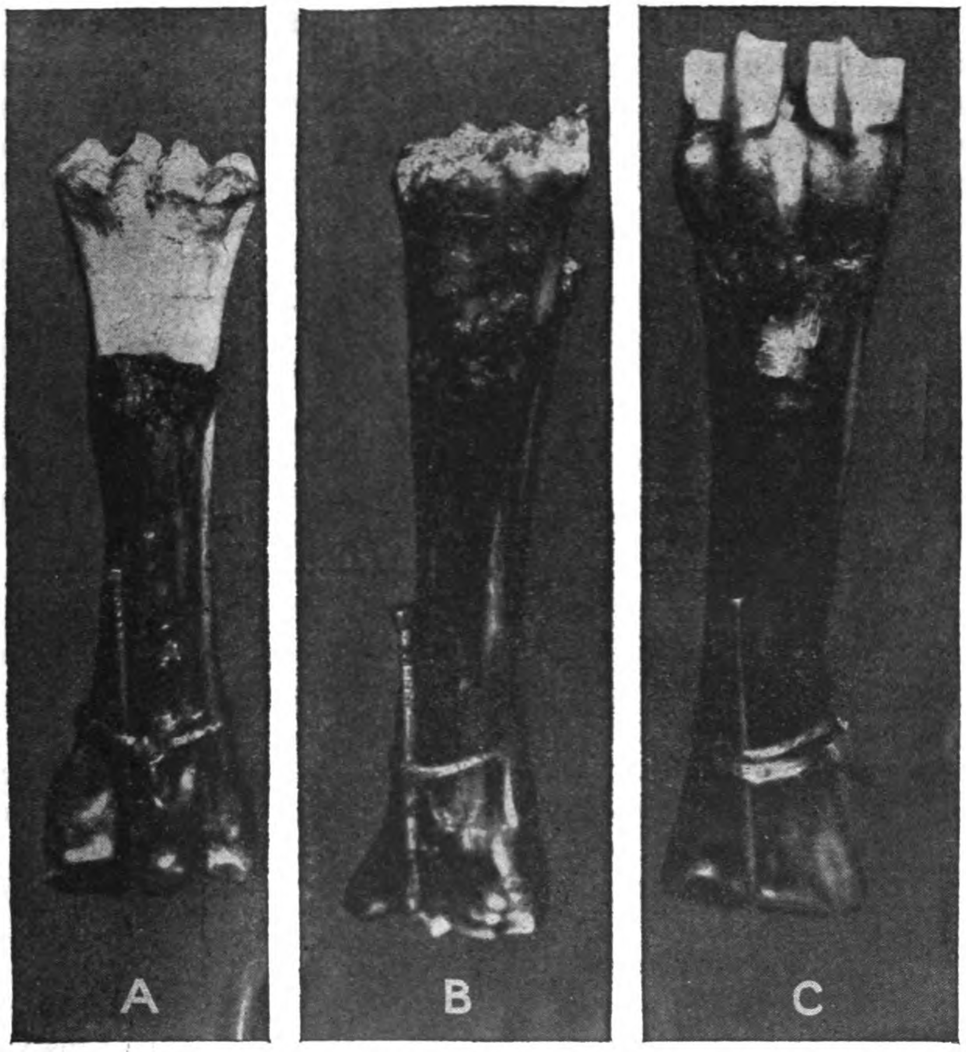


FIGURE 115.—"Break" and "round" joints. *A*, lamb "break" joint; *B*, yearling mutton "break" joint; *C*, mature mutton "round" joint.

(1) *Chicken.*

(*a*) *Types.*—Commercially chickens are separated into various groups, based largely on the age and size factors. After maturity, sex also becomes a factor.

1. Broilers.—Young birds (8 to 15 weeks), of either sex, weighing up to 2½ pounds each.

2. Fryers.—Young birds of either sex somewhat larger and older than broilers, weighing up to 3½ pounds each.

3. Roasters.—Quickly grown young male birds of sufficiently large size to be desirable for roasting. Weights run from $3\frac{1}{2}$ pounds up.

4. Fowl.—Female birds exceeding 1 year in age used largely for stewing purposes.

(*b*) *Grades.*—For trading purposes, each of the above types of chicken is divided into grades—special, prime, choice, and commercial. The special grade is nearly perfect; the commercial grade is edible, but not good enough to receive a higher grade. The Army for ration purposes purchases the choice grade roasters, which should have these characteristics: fairly well fleshed breast; carcass fairly well covered with fat; may have a few pinfeathers over entire carcass; crop must be empty; slight bruises permitted; weight per bird as specified.

(2) Dressing terms used in poultry trade:

(*a*) *Fresh killed.*—Delivered within 48 hours from time of slaughter in good condition.

(*b*) *Fresh chilled.*—Delivered within 30 days from time of slaughter and continuously kept in good chilled condition throughout the period.

(*c*) *Frozen.*—Must be solidly frozen at time of delivery.

(*d*) *Dressed.*—Killed, bled, and feathers only removed.

(*e*) *Drawn.*—Dressed, plus removal of the head, feet, and entrails. Drawn chickens will spoil very quickly and it is imperative to use them promptly upon receipt.

(3) *Turkey.*—(*a*) In the production of turkeys, it is planned to have birds reach their maximum growth and finish at Thanksgiving or Christmas periods. A large portion of those not sold fresh during this time are frozen for later sale. Because of this, it is possible to obtain desirable turkey from the holiday period on through late spring. This is advisable to know, as it may be possible to substitute turkey for chicken at a considerable saving.

(*b*) Turkeys are classified according to age and sex—for example, young toms and young hens, both of various weights. The hens will have more fat, are usually smaller, and often are more expensive.

(*c*) A desirable turkey should be of the sex and weight specified. It should be plump, with a well developed breast and carcass, and fairly well covered with fat. May show a few scattered pinfeathers. The cartilage on the breastbone should be soft and pliable.

389. Inspection.—*a.* AR 40-2260 provides for several classes of meat inspection, dependent largely on the circumstances under which each is made. These include establishment inspection; ante-mortem and post-mortem inspection of animals; product inspection prior to purchase, on delivery at purchase, and on delivery other than at pur-

chase (shipped from one supply office or station to another); inspection while in storage; and inspection at the time of issue.

b. Assuming that an inspection on delivery at purchase is being made, the procedure should include the following investigations:

(1) Source of the product. Unless from an establishment maintaining Bureau of Animal Industry inspection, the source must have been approved by the Veterinary Corps.

(2) The cleanliness of the truck, or car, and clothing of the meat handlers; the method of protecting the product from contamination—closed truck, or meats wrapped or boxed; the method of maintaining a satisfactory temperature of fresh products. In general, the temperature should be about 50° F., except for highly perishable foods, in which case it should be lower.

(3) The presence or absence of the Bureau of Animal Industry inspection legend on products produced from cattle, sheep, swine, or goats. Products from these species of animals cannot be accepted unless they carry this legend, except as provided for in (1) above.

(4) The soundness of the product. This is based on factors discussed in prior and succeeding paragraphs. The meat must obviously be clean and free from contamination.

(5) The quality. Based on factors also discussed in other paragraphs. In general, the Army buys a quality in which the word "good" is quite descriptive and will compare favorably to foods carried in high-class retail stores. The exact quality desired is stated in the contract and outlined in detail in pertinent Federal specifications. The inspector should have a copy of the contract and the specifications, both of which should be available in the office of the quartermaster.

(6) The kind or class of the product offered. This may be entirely different than specified in the contract and obviously not acceptable—for example, cow beef instead of steer beef; mutton instead of lamb; fowl instead of fryers; pork shoulders instead of ham.

(7) The method of trimming or dressing, as indicated in the contract. Examples of nonacceptable trim frequently offered are beef hearts without the contiguous blood vessels and connective tissue, so-called "heart cap" removed; long cut instead of short cut ham; beef brisket without the "deckel" removed.

(8) The weight tolerance. This will be stated in the contract and is highly important, as there is a considerable difference in price based on weight. As an example, 14- to 16-pound pork loins are cheaper than 8- to 10-pound loins, and a light weight dressed fowl (3 pounds) is cheaper than the heavier (4½ pounds) weight.

(9) Method of packing or wrapping, and marking. See that these requirements are as specified in the contract.

c. If the several factors indicated in *b* above are found to be in accordance with the contract and Federal specifications, the product is accepted, placed in proper storage, or issued, and the purpose of the inspection, both sanitary and for quality, will have been fulfilled.

SECTION II

DAIRY AND DAIRY PRODUCTS

390. General.—*a.* The fact that milk is a highly nutritious food, not only from the standpoint of human consumption, but also for the growth and multiplication of bacteria, makes an inspection and supervising service for the production and handling of this product necessary. Among the more common diseases transmissible to man through milk are tuberculosis, diphtheria, scarlet fever, typhoid fever, septic sore throat, undulant fever, and the common diarrheas. Contamination of milk may arise from two general sources—first, milk may be infected if taken from diseased animals; second, it may become contaminated by improper processing methods or by dairy workers who are carriers of disease. The quality of the milk and milk products, such as butter, cheese, and ice cream, must also be frequently investigated and maintained at an approved standard in order to prevent a reduction of food value or a health menace through the use of adulterants. The inspection of dairy products intended for use by the Army is conducted by the personnel of the Veterinary Corps, usually in cooperation with Federal, State, or municipal health agencies.

b. The first step in the inspection must necessarily take place at the point of production, this being the dairy farm. Here the health of the producing herd is examined. If diseased animals are present they must be immediately removed, and the herd examined periodically thereafter to eliminate animals that may later become infected. The dairy farm must employ only milk workers who have been shown, by physical examination, to be free from disease. The animals must be cared for in such manner, and the physical equipment of the dairy farm, such as barns, milk house, and utensils, must be so constructed

and maintained as to minimize the possibility of contaminating the milk during the time of milking. The milk is cooled immediately following milking and so held until time of pasteurization.

c. At the milk plant or the establishment at which the milk is pasteurized and bottled or further processed to make butter, ice cream, or cheese the inspection is extended to the physical equipment of the plant, methods employed in the handling and processing of the milk, and again to the health of the personnel. It is during this phase that particular attention must be directed to the process of pasteurization. By "pasteurization" is meant the heating of every particle of milk to 142° to 145° F., and holding at this temperature for 30 minutes. Another method consists of heating to 160° F. for 15 seconds. (See figure 116.) While pasteurization kills the disease-producing bacteria, a few of the heat-resistant bacteria are not affected. This latter group will not produce disease but will contribute to a later spoilage of the milk if it is not properly cooled and handled.

d. Pasteurization is in no way to influence the care in handling milk, since it does not make an unclean milk clean. It serves only to eliminate disease-producing organisms and will not remove dirt and filth which finds its way into milk through faulty methods. An important feature of this step in the inspection procedure is the investigation of the pasteurizing equipment, bottling machine, bottle-washing machine, and sterilizing equipment and solutions. No amount of care in the production of milk will compensate for faulty or insanitary equipment at the milk plant. The manner of handling during transportation to the consumer must be supervised from the standpoint of maintaining refrigeration, reducing time required for delivery, and maintaining delivery equipment in a clean and sanitary condition.

e. The equipment used and the methods of production having been established as complying with Army standards, it is next necessary to investigate further the finished product as regards quality and soundness. The requirements for dairy products must be adapted to each individual type and variety. These are covered briefly in the following paragraphs. (For detailed requirements see Federal specifications.)

391. Types of milk.—*a. Fresh milk.*—Except for foreign stations, fresh milk is the type most commonly purchased by the Army. Specifications for fresh milk require that it be from an approved source, fresh, clean, and free from objectionable odors and flavors; that it has been subjected to pasteurization and shows a low bacterial count. The butter fat contained in the milk must be adequate to conform to requirements and the total milk solids not below a minimum

level. This type milk must be delivered at 50° F. or lower temperature within 24 hours following pasteurization and shall contain no added water, preservatives, or other foreign substance. Immediately after receipt it should be placed under refrigeration at 36° to 40° F.

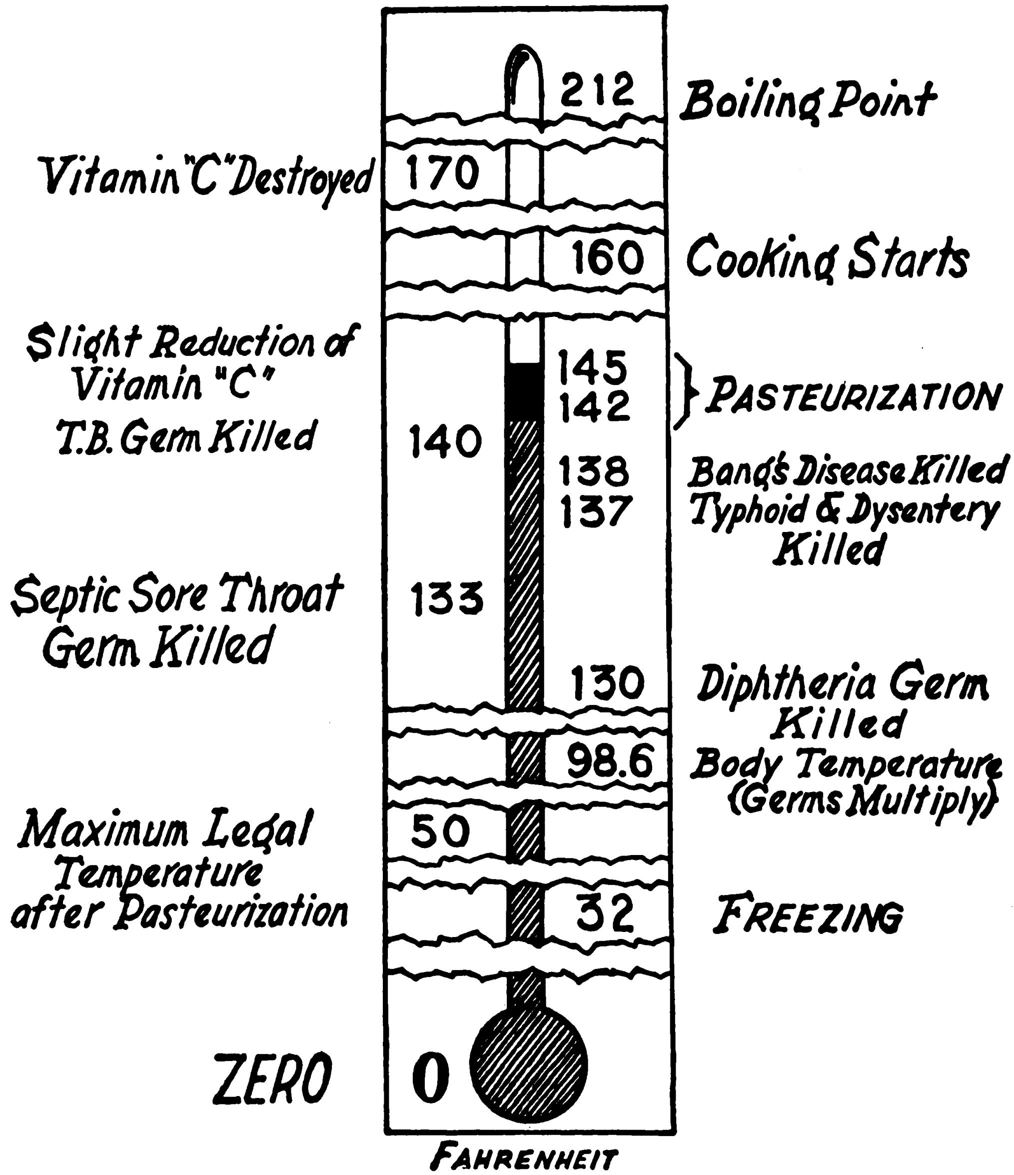


FIGURE 116.—Effect of heat on milk.

b. *Condensed milk*.—Condensed milk is prepared by the evaporation of a considerable portion of the water from whole, fresh milk and the addition of a relatively large amount of sugar as a preserving agent. The extent to which the evaporation process is carried is governed by percent of milk solids remaining, which amounts to slightly over one-

third of the total. Condensed milk shall be of uniform consistency, good flavor, and free from lumps, sediment, and foreign impurities.

c. Evaporated milk.—The process in preparing evaporated milk closely parallels that employed in condensed milk, with the exception that no sugar is added and a slightly lower minimum standard for the amount of milk solids is established. Both condensed and evaporated milk are to be supplied in hermetically sealed tin containers of various sizes with the lot (code) number, or the number designating the batch or run, embossed on the can. The code number makes it possible to select samples from different runs for analysis. The heating, which is necessary for evaporation, of these types of milk serves to kill bacteria; therefore pasteurization is not required. While sugar is used as a preservative in condensed milk, the high temperature necessary to drive off the water in the case of evaporated milk is alone relied upon to kill all bacteria which are capable of causing deterioration. During storage in warehouses, commissaries, etc., canned milk must be inspected periodically to eliminate any that may have undergone spoilage due to incomplete sealing or faulty cans. (See par. 399*d*.)

d. Powdered milk.—Powdered milk is prepared from whole or skimmed cow's milk which has been evaporated to dryness either under atmospheric pressure, in vacuo, or by what is known as the "spray process." In the latter, the milk is sprayed in very fine particles into a current of heated air wherein the moisture is removed. The requirements for milk powder produced under each method varies slightly, due to the difference in effect on fluid milk of the individual processes. Powdered milk must be reasonably uniform in composition, free from lumps, have a white or light cream color, and be free from any yellow color and black or brown specks. On reconstitution the flavor shall be sweet, clean, and free from all foreign flavors and odors. By the term "reconstitution" is meant the addition of a certain amount of water to a given amount of milk powder to produce a fluid milk. The value of dried milk as a food product is dependent upon its solubility, butterfat content, bacterial count, moisture, and sediment, all of which are governed and controlled by inspection regulations.

392. Ice cream.—As in the case of all other dairy products, the milk used in the manufacture of ice cream must come from dairies and milk establishments that conform to sanitary requirements. During the process of making ice cream, milk must undergo pasteurization and the constituents of the finished product must comply with standards laid down, both in quality and amount. In general, ice cream must be the pure, clean, frozen product made from sweet cream, milk or milk products, sugar, and harmless flavoring. It may

contain certified food color, gelatin, and eggs. It must weigh not less than 4½ pounds per gallon.

393. Butter.—Butter is made from either sweet or sour pasteurized cream. It is prepared by churning or otherwise agitating the cream to the extent that the fat globules contained in suspension are caused to coalesce, or adhere to each other, thereby allowing the butterfat to be removed as a mass. The butterfat is then washed (to remove remaining buttermilk), worked, and salted, the latter lending a desirable flavor. In scoring butter the factors considered are flavor, body, color, salt, and package, each factor carrying a proportionate amount of weight in the order of its importance. Approximately 82½ percent of butter is composed of butterfat, the remainder being water, salt, and curd. For Army consumption, butter is purchased in ¼- and 1-pound prints in cartons, in 1-pound tins, and in 5-pound cans or tins. Butter readily absorbs odors and should be stored under refrigeration separate from meats, cheese, and similar products.

394. Cheese.—This product is prepared by the addition of rennet to milk, resulting in a separation of the curd and whey. The whey, or fluid portion, is drawn off and the curd is pressed to consolidate it and remove remaining whey, salted, and allowed to ripen. The ripening is due partly to micro-organisms and fungi and partly to the action of an enzyme natural to milk. There are a great many kinds and varieties of cheese, usually depending upon the countries in which the manufacture of each particular type originated. For the most part, however, purchases for the Army are limited to the type known as American cheddar, which is a product prepared from whole milk. The factors that govern the grading of cheese in order of importance are body and texture, flavor, finish, and appearance and color. To comply with specifications cheddar cheese must draw a full plug, must contain no gas holes, must not be mottled, be reasonably free from outside mold, have closed surfaces, and meet requirements of moisture and milk-fat content. Process cheese is prepared by mixing one or more lots of cheese into a homogeneous, plastic mass by the addition of heat with or without water and an emulsifying agent.

395. Laboratory examination of milk and dairy products.—*a.* In the laboratory the finished product is given the final inspection and analysis from the viewpoint of sanitation and quality. It must be emphasized that the selection of the sample and its proper packaging and care in transfer to the laboratory is primarily important if a truly representative analysis is to be made. Samples should be submitted for analysis in the original unopened containers, except

when samples are taken from wholesale lots to determine the efficiency of pasteurization or check on the methods of cooling and transporting. When sending samples to the laboratory, icing is always to be recommended, care being taken that the bottle cap is protected from water formed by melting ice (which is contaminated) by the use of oil paper or some similar material held in place by rubber bands. Sufficient ice to insure proper cooling of the sample for the entire trip should be used. Icing of samples may be omitted when chemical preservatives are used, such as one drop of a 40 percent formaldehyde solution to each 10 cubic centimeters of milk in the sample bottle. However, the addition of such preservatives must be noted by the sender on the request for analysis. When samples are submitted in other than the original container, a ground glass stoppered bottle of a size sufficient to contain 100 to 150 cubic centimeters of the sample is desirable and must be sterilized prior to use. In the collection of samples from wholesale lots, a sterile pipette is to be employed for each sample taken; this is to prevent contamination of both the milk sample and the wholesale lot from which the sample is removed.

b. In connection with requests for laboratory analysis for butter and cheese, it should be remembered that these products are most accurately scored immediately upon receipt from the contractor. When only short distances are involved in the delivery of the sample to the laboratory, and the product is carried directly to this service, a fair and accurate report may be expected. When greater distance exists, however, between the place of receipt and the laboratory, special care must be taken to insure that no deterioration, loss of moisture, or contamination takes place in transit. This calls for adequate refrigeration and inclosure in a clean, dry, airtight container.

SECTION III

MISCELLANEOUS FOOD PRODUCTS

396. General.—"Miscellaneous products" is an arbitrary term which permits considerable latitude. It is used here to include such foods as cured and canned meats, sausages, eggs, and fish commonly purchased for Army use.

397. Cured products.—*a. Definition.*—Cured meats are those meats preserved with authorized chemical agents.

b. Purposes.—(1) Improve keeping qualities.

(2) Produce desirable flavor.

(3) Fix the color.

c. Ingredients used.—Salt, sugar, vinegar, spices, nitrates, nitrites, water, and wood smoke.

d. Methods used in curing.—(1) *Dry salt.*—The pieces of meat to be cured are thoroughly rubbed with salt and placed in a pile in which each layer is covered with salt. At intervals the piles are overhauled, resalted, and repiled. In 30 to 40 days the meat will have a grayish color, indicating the proper cure. Salt pork is an example of this method of cure.

(2) *Sweet pickle.*—(*a*) The chemicals to be used are dissolved in water to make a pickle. This is injected into the meat, which is then placed in a vat and pickle is added until the meat is entirely covered. At intervals overhauling is done, pickle checked, and in approximately 60 days hams will be cured. They are removed, washed, and hung to drain and then smoked for several hours at temperatures ranging from 105° to 125° F.

(*b*) A recent improvement in this method of cure is a greatly shortened process called the tenderized process. This cure is accomplished by the use of fast-curing chemicals which are pumped into the meat through the blood vessels. In 10 or 15 days the cure is completed and the smoking is done at a much higher temperature. The advantages of this method are faster turnover, less shrinkage, and greater appeal to the public. However, due to the higher moisture content, meat cured in this manner is more perishable. A high percent of all hams now produced are cured by this method.

(3) *Dry cure.*—The mixture of chemicals is rubbed on the pieces of meat, which are firmly packed in a watertight box. Moisture is extracted from the meat to form a pickle. This method of cure causes considerable shrinkage but produces a very desirable cure. The major portion of first quality bacon is dry cured.

e. Products.—(1) *Bacon.*—Bacon is prepared from the hog's belly by curing and smoking. When received it should be properly wrapped and of the weights specified. It should have a bright appearance, be light brown in color, dry, fairly firm, and have relative proportions of lean and fat. It should be boneless and free from bruises and skin cuts. Moldiness, rancidity, and contamination are cause for rejection. It should be stored under refrigeration.

(2) *Ham.*—Ham is prepared from the hog's hind leg by curing and smoking. It should be bright, plump, dry, and closely trimmed, and fat should not exceed 2 inches in thickness. It should be the weight specified and properly wrapped. In inspecting hams a trier (similar to an ice pick) should be inserted along the bone and in the deep muscle to detect odors of spoilage. Causes of rejection and storage are the same as for bacon.

(3) *Picnics.*—Picnics are prepared from the lower portion of a hog's front leg in the same manner as hams. They are cheaper in cost, but inferior to ham in quality.

(4) *Canadian bacon.*—Canadian bacon is made from the meaty portion of a pork loin. It is boned, cured, and smoked. It appears as a roll about 4 inches in diameter and 24 inches in length, and usually in cellophane wrapping.

(5) *Dried beef.*—Dried beef is secured from the round of beef, cured, dried, and smoked. It is usually purchased in sliced form or canned. It should be bright in color, pleasing but salty to the taste. Slices should be uniform and not in little pieces. The fat should be tasted, as rancidity or staleness will usually first appear here.

398. Sausages.—*a. Definition.*—Sausages are mixtures of meat, cut in small pieces or finely ground, and packed in cartons, or stuffed in casings.

b. Ingredients.—Meats, spices, curing agents, water, casings, either natural or artificial, and wood smoke.

c. Classification.—The varieties of sausage are very numerous. Each nation has its own favorites. The following includes only a general classification together with a brief description of those varieties more commonly used in the Army:

(1) *Fresh.*—These are sausages which are not cured, smoked, or cooked. Being in a fresh state, they are highly perishable and must be kept under refrigeration. Examples are pork sausage and hamburger.

(*a*) Pork sausage is a ground mixture of the pork rather highly seasoned. It is a fresh sausage and must be thoroughly cooked. The appearance should be bright and with about equal proportions of muscle and fat. It may be obtained in bulk, as patties, or stuffed in casings.

(*b*) Hamburger is a ground mixture of beef. The appearance should be fresh and bright red in color. Due to the fact that hamburger often is made from stale trimmings and cheap, inferior products (fat, blood, and lungs) messes are not authorized to purchase commercial hamburger. By using beef cuts and grinding the hamburger themselves, messes can have a better product at a cheaper cost.

(2) *Cooked.*—These sausages are cooked and usually smoked. They may be eaten without further cooking. Examples are frankfurters, bologna, and liver sausage.

(*a*) *Frankfurters.*—Frankfurter sausages, commonly called "hot dogs," are a mixture of ground beef and pork, seasoned, cured, stuffed in casings, cooked, and smoked. The links should be about 6 inches long, with about 10 to the pound. The mixture should be finely ground. Cereals or milk powder are often used in commercial frankfurters but are not permitted in sausage used by the Army.

(*b*) *Bologna.*—Bologna is made similar to frankfurters, but is stuffed in larger casings, approximately 2 inches in diameter by 16 inches long.

(*c*) *Liver sausage.*—Liver sausage is a ground mixture of liver and pork, seasoned, cooked, and sometimes smoked. It is stuffed in casings approximately the size of bologna. It should be soft and moist but not mushy, with grayish-brown color.

(3) *Dry.*—(*a*) Dry sausages are those thoroughly cooked, smoked, and, as the name implies, free from moisture. The keeping qualities are much better than other sausage because of this dryness. They are also referred to as "summer sausage." The more commonly used examples are salami and cervelat (Thuringer).

(*b*) Cervelat is a ground mixture of pork and beef, seasoned, stuffed in casings, cooked, smoked, and air dried. It should appear dry and firm.

399. Canned meat products.—*a. Definition.*—Canning is the sterilization of the product by heat and hermetically sealing in a metal or glass container.

b. Purposes of canning.—(1) To sterilize the product.

(2) To prevent the entrance and growth of micro-organisms.

c. Method.—The canning of meat follows this general procedure: Meats are first parboiled to shrink the product and to reduce the moisture content. The cans are filled with the desired amount, usually some soup stock added; the top of can is crimped on; the air is excluded from the can by vacuum or heating; and the can is soldered. The amount of heat, time, and steam pressure given each product may vary, depending on many factors. However, a temperature of 220° to 240° F. for 2 to 6 hours, under from 2 to 10 pounds of steam pressure may be used. The processed cans are then chilled, cleaned in a caustic bath, and set aside in a warm place, about 100° F., for several days to see if swellers (gas formation inside the can) develop. Labelling, packing, and shipment are the final steps.

d. Defects.—It is advisable to know what is meant by the terms used to describe defects in canned foods.

(1) *Leaker.*—A can containing an opening.

(2) *Overstuffed.*—A can which has been overfilled.

(3) *Sweller.*—A can with gas formation, causing the ends to bulge.

(4) *Springer.*—A can with slight distention at one end and when pressed in the other end springs out.

(5) *Flipper.*—A slight bulge at one end which when pressed stays in.

e. Procedure in examining canned food.

(1) Read label for full information.

(2) Examine outside of cans for holes, rust, general appearance, and evidence of defects listed in *d* above.

(3) Open can and immediately smell and taste contents.

(4) Remove and inspect contents; check weight.

(5) Examine inside of can.

f. Products.—(1) *Roast beef canned.*—The meat should be of good quality, tender, properly trimmed, not too dry, gray in color, and reasonably firm. The liquid or jelly may be clear or slightly colored and moderate in amount. The flavor of the meat should be pleasant and typical of roast beef.

(2) *Corned beef canned.*—Should appear bright red in color throughout, no excess liquid, tender, and pleasing to the taste.

(3) *Corned beef hash.*—Should consist of a mixture of potatoes, onions, and corned beef with approximately 50 percent vegetables and 50 percent meat, although commercial packs may show wide variations in the above percentages. The hash should be dry, evenly mixed, and fall apart readily. It should not be mushy or have black spots from improperly prepared potatoes. The taste should be pleasing, with some onion flavor.

(4) *Bacon.*—Bacon is sometimes put in metal containers, particularly for oversea shipment, and is referred to as canned bacon. However, it is not a true canned product as it is not sterilized with heat. The can acts more as a protective covering, and also permits exhaustion of the air from the container, both of which tend to prevent spoilage.

(5) *Sausage.*—Vienna sausage canned is similar to frankfurter sausages ("hot dogs") except that it is canned. The links should be of uniform length and diameter, tender, and pleasing to the taste. Free liquid or jelly should be present. Pork sausage is frequently canned, and, since it is placed in the cans raw or uncooked, considerable lard will be produced during processing. The fat should be firm and white and the meat grayish in color and easily crumbled.

(6) *Salmon.*—Salmon canned should appear reddish in color, the flesh firm, the bones easily crushed, the flavor and odor pleasing. There should be some free oily liquid. The species of the salmon should be as specified in the purchase order, as some varieties are of very low quality.

400. Eggs.—*a. Definition.*—The term "eggs" is used commercially for hens' eggs only, although those from ducks, turkeys, and other birds are edible.

b. Classification.—(1) *Fresh.*—Not clearly defined, but on many markets fresh eggs are those kept under proper conditions and reaching the consumer within 30 days from the date laid.

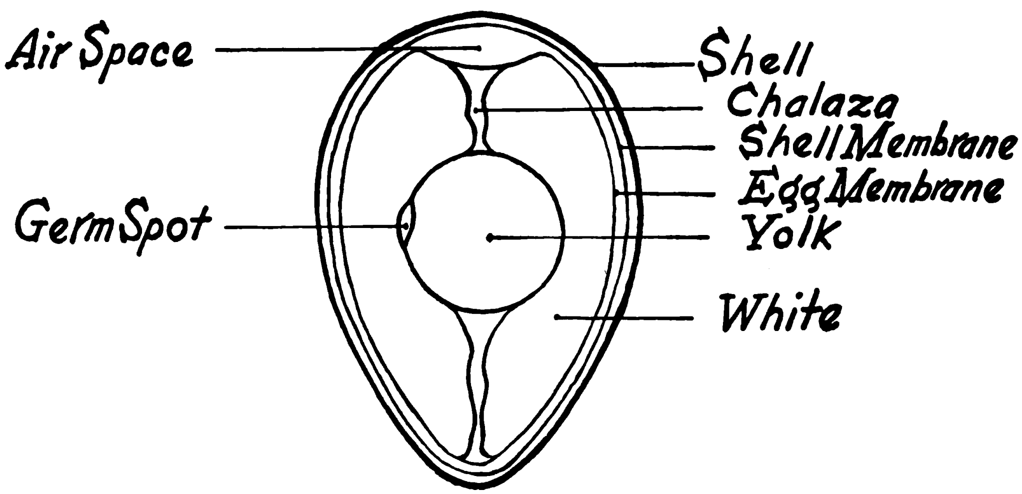


FIGURE 117.—Diagram of internal structure of hen's egg.

(2) *Processed.*—Eggs with the shells oil treated to preserve the fresh quality.

(3) *Storage.*—Eggs placed in refrigeration with a view to holding for a better market.

c. Grades.—Due to the fact that eggs vary in quality and size, it is necessary to further separate them into grades and according to size.

(1) *Special.*—Nearly perfect eggs.

(2) *Extras.*—Excellent quality.

(3) *Standards.*—Fair quality.

(4) *Trades.*—Edible but poor quality.

d. Size.—The size or weight of egg is important and commercially the terms large, medium, and small are used with the grade term to describe the product. Army requirements are for large eggs weighing at least 44 pounds per case (30 dozen) net.

e. Structure.—Figure 117 shows a diagram of the general structure of an egg.

f. Defects.—(1) Cracked eggs.

(2) Movable air spaces.

(3) Yolks stuck to the shell.

(4) Inedible—bloody, musty, rotten.

g. Candling.—(1) Candling consists in holding an egg before a strong artificial light so that the rays of light penetrate the egg, enabling the condition of the contents to be seen. A simple but satisfactory candler may be made by cutting a round hole one inch in diameter in the side of a tin can and setting an electric light inside. The egg should be held in a standing position against the opening with the large end up. By rotating the egg, the condition of the shell, the location and size of the air space, and the position and visibility of the yolk may be determined.

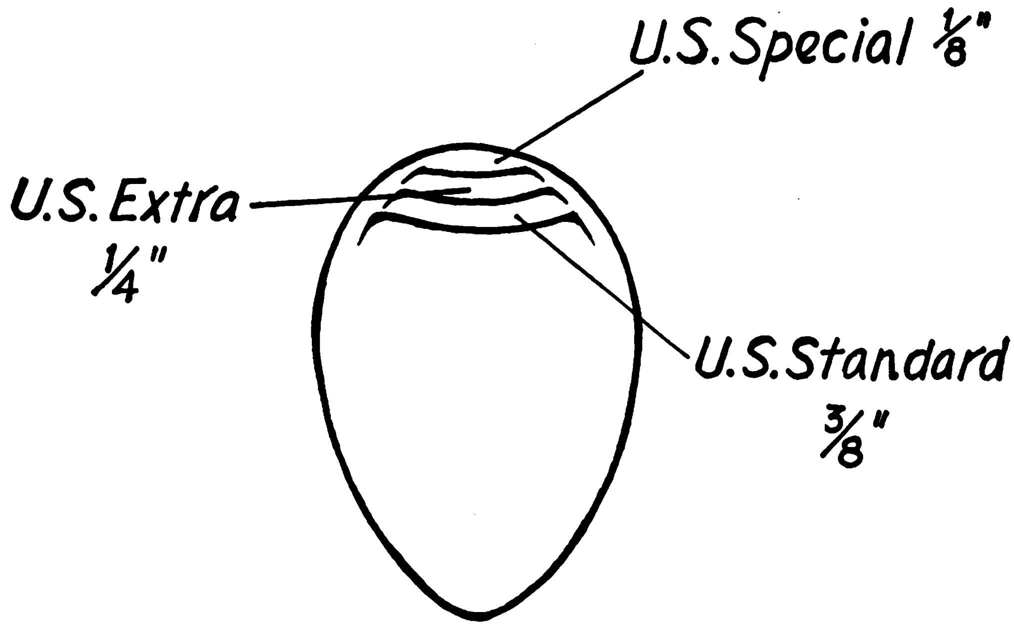


FIGURE 118.—Comparison of depth of air space in eggs.

(2) A desirable egg will have a clean, sound shell, the air space localized in the rounded end of the egg and not over three-eighths of an inch in depth, the yolk dimly visible and centrally located, and the white firm and clear. (See figure 118.) Eggs should weigh approximately 1½ pounds per dozen.

h. Care of eggs.—Eggs are a perishable product and therefore should be kept under refrigeration at all times. Warm temperatures are favorable to the growth of micro-organisms which in turn cause the eggs to lose quality and develop off flavors. Within a few hours, a good grade of eggs can deteriorate into a low grade when kept in a warm place. A storage temperature of 45° F. is advisable.

401. Fish.—*a. Introduction.*—The kinds of fish are so numerous that it is impractical to attempt to classify or describe the various species. All sections of the country use fish, so the local supply should be investigated to determine the kind of fish and type of dressing which is available. Identification of the kinds available on the local market can be learned at the same time.

b. Definition of terms.—(1) *Dressed.*—Means removal of heads, viscera, fins, and scales.

(2) *Fillet.*—A boneless slice cut longitudinally from the side of the fish.

(3) *Steak.*—Fish cut in transverse cuts.

(4) *Fresh chilled.*—Packed in clean, crushed ice and kept in that condition.

(5) *Frozen.*—Solidly frozen while still fresh and maintained in frozen condition.

(6) *Quick frozen.*—Immediately frozen at a temperature of 40° to 50° below zero and maintained in a frozen condition.

c. Inspection of fish.—(1) Fresh dressed fish have a bright appearance, blood in the abdominal cavity is bright, and there is no off odor; flesh is firm and elastic.

(2) Stale fish have a dull appearance, eyes sunken and cloudy; scales not firmly adherent; gills grayish in color, often with offensive odor; flesh soft and pits on pressure; and, if previously eviscerated, blood along backbone dark in color with odor of decay.

d. Products.—(1) *Cod.*—Cod is one of our most used fish, as well as one of the least expensive, and is in the market throughout the year. The color varies from a very dark to pearly gray back with a distinctive pale or white line along the side. The backs and sides have small, brownish spots. Average weights about 6 to 15 pounds. Flesh is firm, white, and flaky.

(2) *Flounder.*—Flounders may be distinguished from all other fish, except sole, by virtue of their having both eyes on one side of the body. (Soles have small, weak, toothless mouths, whereas flounders have larger, straight mouths with teeth.) Flounder is a flat fish with white belly and dark colored upper side and is frequently sold as fillet of sole. The true sole is not available commercially in American waters.

(3) *Haddock.*—Haddock is one of our best known fish. It has a grayish black with a distinctive black line extending along the sides. Flesh is firm and white. Available throughout the year.

(4) *Oysters.*—(*a*) In the natural state oysters consist of a meaty edible portion enclosed in a rough, irregular, bivalve shell. Shucking consists in opening the shell and removing the edible meat. The

shucked oysters are then washed and packed in clean, metal containers. Oysters are graded according to size.

(*b*) Oysters should be strictly fresh, no excess moisture, and of the size specified. The size is determined by actual count. The number in a gallon will vary from about 150 to 300.

e. Stability.—Fresh fish and oysters are highly perishable and must be kept packed in ice.

Appendix I

LIST OF REFERENCES

1. Army Regulations.—*a. General.*

1–10 List of current pamphlets and changes; distribution.
1–15 General provisions.

b. Quartermaster Corps.

30–1150 Medical and dental service on transports.
30–1170 Flags, honors, and salutes on Army transports.
35–1440 Loss of pay during absence due to diseases resulting from misconduct.
35–2320 Payments to enlisted men; general provisions.
35–2340 Pay of enlisted men; rates of pay.
35–2360 Pay of enlisted men; longevity pay.
35–5520 Allotments of pay.

c. Medical Department.

40–5 General provisions.
40–15 Dental Corps—General provisions.
40–100 Standards of miscellaneous physical examination.
40–105 Standards of physical examination for entrance into the Regular Army, National Guard, and Organized Reserves.
40–110 Standards of physical examination for flying.
40–210 The prevention of the communicable diseases of man—general.
40–215 Prevention of the communicable diseases of man—immunization.
40–275 Sanitary reports.
40–505 Medical attendance—general provisions.
40–510 Dental attendance.
40–520 Central dental laboratories.
40–590 The administration of hospitals, general provisions.
40–1005 Reports, returns, and records.

40-1010 Dental reports, returns, and records.
40-1025 Records of morbidity and mortality.
40-2005 to 40-2275, incl. Veterinary regulations.

d. Officers' Reserve Corps.

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210-10 Administration.
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340-15 How conducted.

g. Military records.

345-10 to 345-80, incl. Military records.

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600-40 Wearing of the uniform.
600-100 United States Government life insurance.
600-185 Efficiency reports.
600-500 Care and disposition of the insane.
600-550 Deceased.
600-600 Designation of beneficiaries.

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615-15 Appointment and reduction of noncommissioned officers and privates, first-class, medical department.
615-20 Rating and disrating of specialists, medical department; medical, dental, and veterinary services.
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615-275 Furloughs, passes, and delays.
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615-300 Deserters.
615-360 Discharge.
615-395 Retirement.

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8-10	Tactics and technique of medical service of infantry and calvary divisions.
8-15	Tactics and technique of medical service of corps and army.
8-20	Tactics and technique of medical service of theater of operations.
8-25	Medical service in joint oversea operations.
8-35	Transportation of sick and wounded.
8-40	Field sanitation.
8-45	Records of sick and wounded.
8-50	Standard splints and appliances.
8-55	Reference data.
21-5	Military training (training management).
21-6	List of training publications.
21-10	Military sanitation and first aid.
21-15	Equipment, clothing, and tent pitching, mounted and dismounted organizations.
21-20	Physical training.
21-50	Military courtesy, salutes, honors, and discipline.
21-100	Soldier's handbook.
22-5	Infantry drill regulations.

3. Technical manuals.

a. Common and arm or service subjects.

3-205	The gas mask.
3-215	Military chemistry and chemical agents.
3-220	Chemical decontamination.
3-305	Use of smokes and lacrimators in training.
8-210	Sanitation of camps and stations.
8-250	War casualties.
8-255	Military preventive medicine.
8-270	Medical department laboratory methods.
8-285	Prevention and treatment of casualties from chemical agents.
8-290	Manual for medical department officers.
9-1290	Pyrotechnic pistols.
10-205	Mess management.
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10-320	Fiscal accounting.
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8-275	Roentgenology.
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8-305	Notes on cardiology in aviation medicine.
8-310	Notes on physiology in aviation medicine.
8-315	Notes on administration in aviation medicine.
8-320	Notes on psychology and personality studies in aviation medicine.
8-325	Outline of neuropsychiatry in aviation medicine.

APPENDIX II

ACKNOWLEDGMENT

Figure 9, from Spalteholz's *Anatomy*, is used through the courtesy of The C. V. Mosby Company, Medical Publishers, St. Louis.

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